MODERN PLASTICS

E. F. LOUGEE, Editor
C. A. BRESKIN, Publisher
Dr. G. M. KLINE, Associate Technical Editor

Of General Interest

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Next Month

The new Sparklets syphon is just beginning to reach the market. Its problems of design and construction make interesting reading and we shall present an outline of some of the difficulties encountered in molding its Plaskon cap and spout. To avoid undercuts and permit the spout to be molded in a vertical position, a nine-ton press had to be cocked on its ear at the plant of the Boonton Molding Company where, at a precarious angle, it is running night and day trying to meet the demand created by the redesign of this household accessory.

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JEAN MAYER, Associate Editor PERRY H. BACKSTROM, Advertising Mgr. M. A. CLINE, Art Director
DANIEL R. LEWIS, Western Manager L. P. SIEGEL, Production Manager R. G. GERMAISE, Circulation Manager
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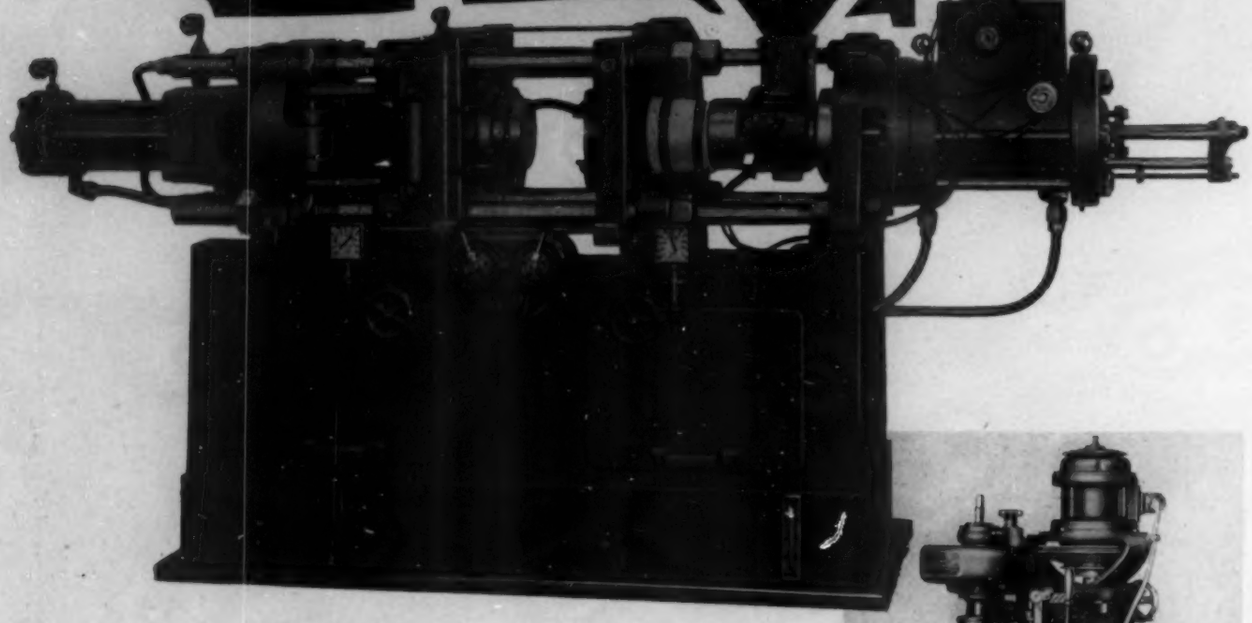
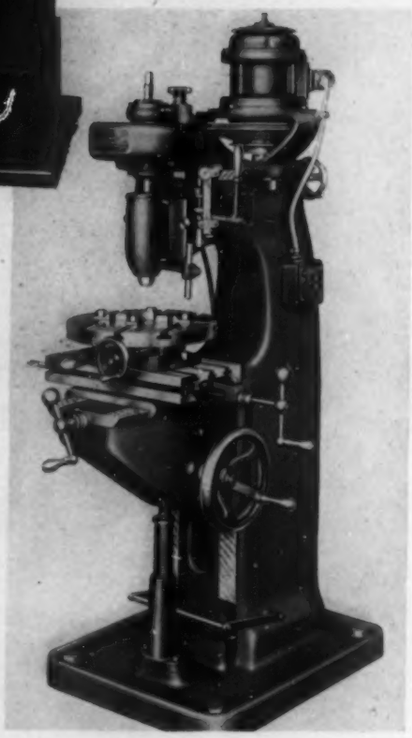
ADVERTISING PAGES REMOVED

REED-PRENTICE

Number 10 fully-automatic, hydraulic

INJECTION PLASTIC MOLDING MACHINE





This machine is, undoubtedly, the most advanced on the market. . In output, in quality of work, in freedom from breakdown and complications it offers much more than has hitherto been available.

It is impossible, in limited space, to adequately stress the important innovations embodied in its construction. We invite interested manufacturers—and this should include all those who have previously rejected injection molding because of the failings of earlier machines—to write us for full details and arrange for inspection of machine in actual production.

GENERAL SPECIFICATIONS

Capacity of Hopper Slide, 7 c/in. Gran. Material, 2 3/4 c/in. Molded, 2 oz. Molded. Estimated shots per hour, 300–400, 500 cu. in. molded material per hr., 24 lbs. per hour. Maximum pressure per square in. on material, 500 to 20,000 lbs. sq. in. Maximum injection area of mold capacity, 24 sq. in. Diameter of plunger, 1 3/4". Stroke, 7". Pressure Regulating Valve. Approximate power consumption for heating unit, 0.5 to 1.5 KWH. Size of die plates, 18" x 20". Capacity of Feed Hopper, 20 lbs. Space between bars, 12" x 12". Die opening, 8". Maximum die space, 18". Minimum die space, 6". Diameter of tie bars, 2 1/2". Motor recommended, 5 HP 1200 RPM. Floor space, 11' 6" x 3'. Net weight, 7600 lbs.

THE REED-PRENTICE 2V ROUTER AND VERTICAL MILLER

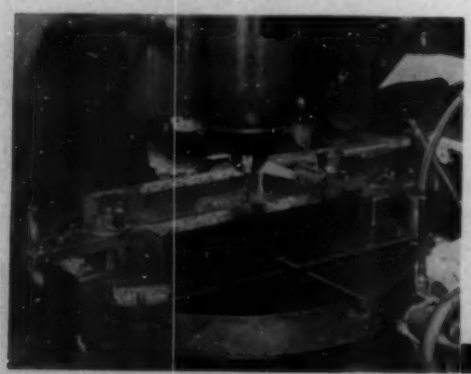
THE IDEAL MACHINE FOR PLASTIC MOLD-MAKING

Used throughout all industry by diemakers, it has many features particularly fitting it for the fine work of the molding field.

SPECIFICATIONS

Longitudinal feed	16"
Cross feed	11"
Vertical feed knee	15"
Distance spindle to table	17"
Distance spindle to frame	15"
Table working surface	20 1/4" x 8 7/8"
Spindle speeds	500–12,000 RPM
Weight	1650 lbs.

2V miller at Chicago Molded Products Corporation machining steel bakelite mold.



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MACHINE TOOLS

WORCESTER MASS. U.S.A.

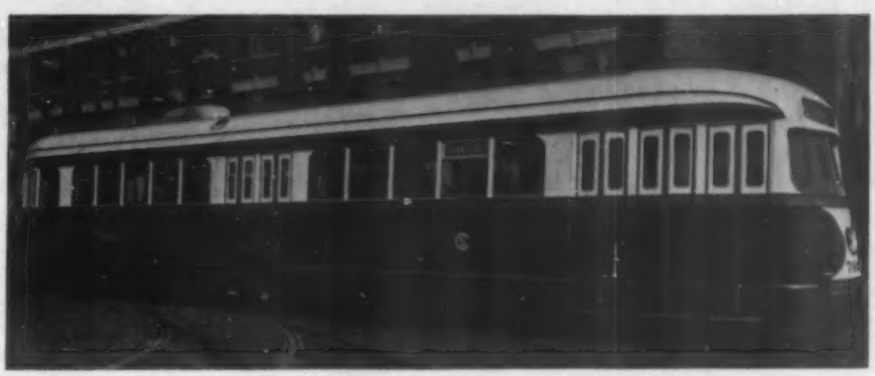
NEW YORK OFFICE: 125 BARCLAY STREET

Neff Kohlbusch & Bissell, 2400 West Madison Street, Chicago
Mr. L. H. Mesker, c/o Hotel Hollenden, Cleveland, Ohio
Sterling-French Machinery Co., New Center Bldg., Detroit, Mich.
Triplex Machine Tool Corporation, 125 Barclay Street, New York City

MODERN PLASTICS
DECEMBER 1936 VOLUME 14 NUMBER 4

WITH LIGHTS AND BELLS

Chicago Surface Lines publicly indicates the class of fare paid by each of its millions of passengers every day



One of the new C. S. L. cars in which these fare registers are used

A NEW TYPE FARE REGISTER HAS BEEN DEVELoped recently by the Chicago Surface Lines for use on street cars and buses. This register, which was designed to accommodate five different fares, is unusual in many respects and incorporates certain novel and valuable features some of which were accentuated through the use of plastic materials. The device is unusual in that registrations are accompanied by sound and light indications which are distinctive for each class of fare. (See Figs. 1, 2, 3, 4.)

The complete register is contained in a small case mounted in front of the conductor's position with the top approximately 40 inches above the floor. Since the register emits the sound and visual indications directly in front of the passenger and substantially at the point where the fare is passed from passenger to conductor, it is believed that many passengers will become so well acquainted with the indications accompanying the correct registration of their fares that omissions or mis-registrations will attract their attention.

For example, a passenger accustomed to hearing a single soft low tone and seeing a white light when his regular seven cent fare is registered, will be attracted immediately if the conductor should register a three cent, which always sounds off a three note chord accompanied by red color indications.

The sound indications are provided by pleasing chimes sounded individually in rapid succession or in chord formation. The visual indications are obtained by illuminating the top of the register in colors different for each type of fare. These color indications are supplemented by words or figures which show the specific type or amount of fare registered. This effect is obtained by individual illumination of small compartments on the passenger's side of the register.

Plastic materials have played a very important part in the design of the top or cover section of the register. A metal cover with the window fabricated from sheet material might have been used and would have provided a limited area for the visual indications on the top and a short distance down the passenger's side (see Figs. 5 and 6) but an inside frosted cover, molded of transparent Tenite, a cellulose acetate material, is much more satisfactory. This cover aids in attracting the passenger's

attention and provides a maximum of surface for the visual indications. The decision to use a molded acetate cover for this most vital part was reached very early in the development of the register.

In addition to greatly increasing the illuminated surface of the register top, the use of the molded material permitted the selection of a pleasing modern design embracing the cover and case as a unit. Such a design could not have been used to full advantage with a fabricated cover. The molded material also provided an outer surface which was smooth, pleasing to touch and easily cleaned. Elimination of the large and complicated window joint, which would have been difficult to insulate against seepage of dust and moisture, was a distinct advantage. Furthermore, since plastic materials are nonconductors of electricity, the molded cover offered complete protection for passengers and trainmen against shock due to electrical leakage. Light weight and lower cost were extra advantages gained by the use of a molded transparent cover.

The exterior treatment of the register was developed by W. B. Petzold of General Electric and the design used was selected for its harmony with the interior of the modernized cars and buses. In this design, special attention was also given to features which would attract attention to the register top. The smooth contour reduces possible injury to passengers and also facilitates cleaning of the cover.

The assembled cover consists of the following plastic parts:

A. One main cover molded of transparent Tenite and inside frosted,

B. Two toggle housings molded of transparent Tenite, wedge fitted to the main cover and held in place with threaded drive screws,

C. One removable transparent window of Fibestos, an acetate material made by the Fiberloid Corp., wedge fitted to the main cover and secured to this piece with threaded drive screws, and

D. Light compartment separators of $^{3}/_{32}$ in. and $^{5}/_{32}$ in. sheet Fibestos fastened to the main cover with cement and drive screws.

The operating toggles are mounted in the top of the register and are used in registering four of the five fares. These toggles (two per register) are molded of black Tenite on navy brass inserts.

While only 100 of these registers are being placed in service at this time, it is expected that between 3000 and 4000 units will be purchased to completely equip the property after a test period, sufficient to prove the design of the operating mechanism and other parts of the register.

It was originally intended to use a molded plastic case as well as the acetate cover on both the initial and final lots of registers, but due to the probability of minor changes in the construction of the housing after testing

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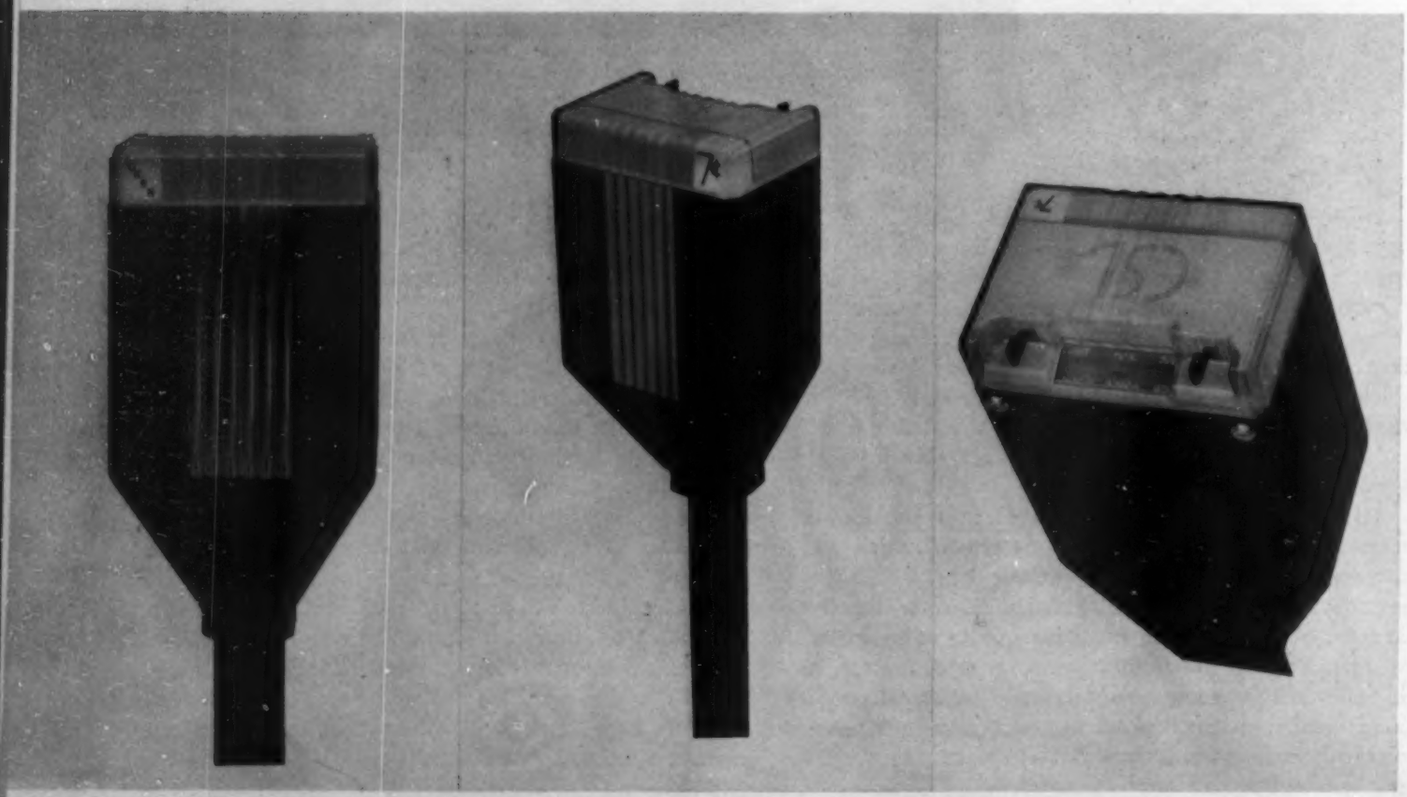
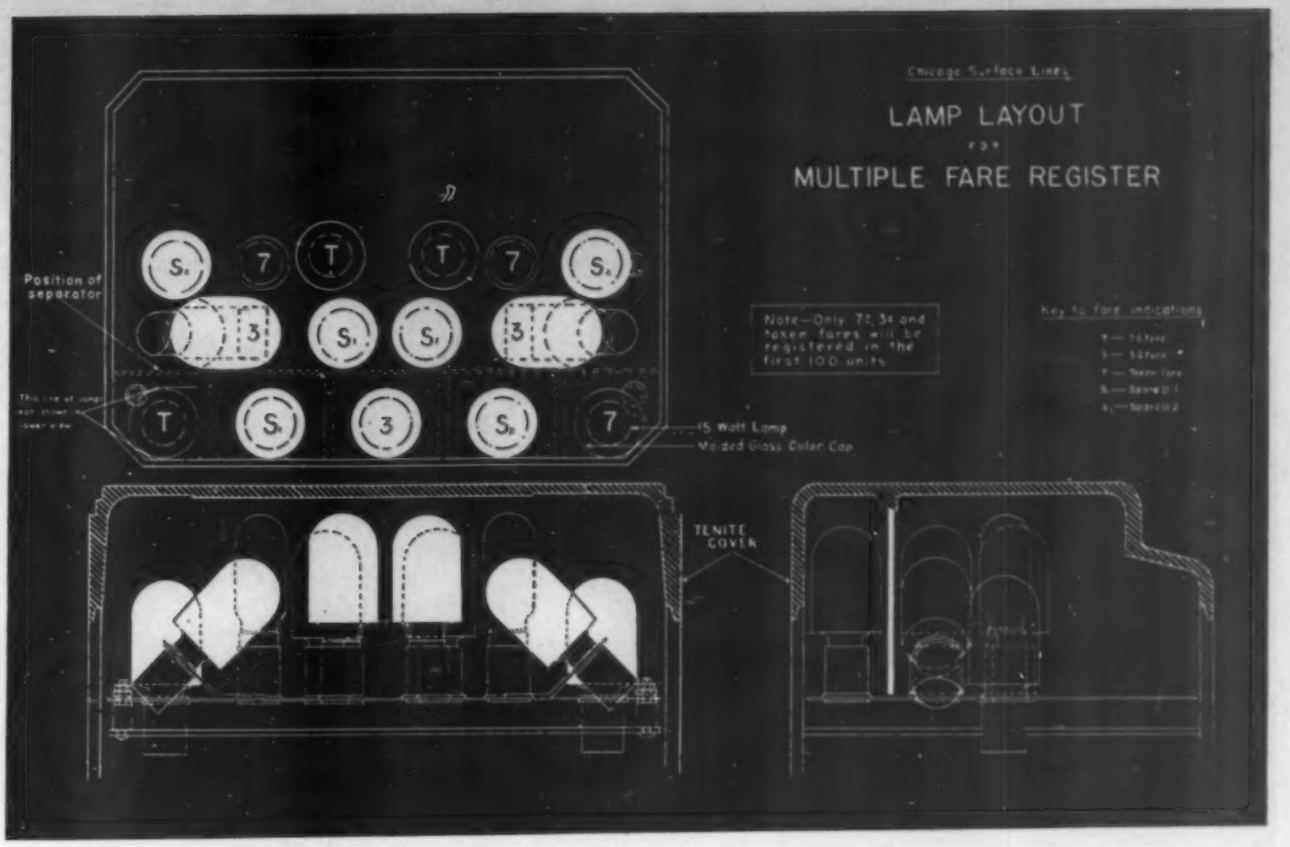


1. Passenger's side of fare register showing token compartment brightly illuminated. 2. Passenger's view showing top of register illuminated to indicate a 7¢ fare. 3. View of top from conductor's side



4

4. Diagram of lamp layout showing the use of a translucent acetate cover for illumination. 5–6. Front and top views of original register model with a large window in a cast aluminum cover which was later replaced as shown in Figures 1, 2 and 3

5 6

the mechanism in this first lot, metal cases were selected for the initial 100 units. It is probable that plastic cases will be used in the final lot because of their lower cost, lighter weight, permanent finish and dielectric qualities.

The outside dimensions of the main cover piece are $^{10}/_{12}$ in. by $7^{1}/_{2}$ in. by $2^{3}/_{8}$ in. The successful molding of this part represents a distinct advance in the art of molding plastic materials because of its size. The cover was molded by General Electric Company. The register operating mechanism was designed by International Register Company and engineered by L. M. Traiser of Chicago Surface Lines.

The first covers were delivered by the molder in June of this year, but the complete registers were just recently placed in service on the 83 new streamline cars constructed for this property.

The simple and practical application of a translucent plastic to provide the exacting illuminating requirements on this fair register resulted from the close cooperation of the engineering divisions of the Chicago Surface Lines, The International Register Co. and the plastics division of the General Electric Company.

RESIN FILM AS A PLYWOOD ADHESIVE

by THOMAS D. PERRY
The Resinous Products & Chemical Co., Inc.

A development which has successfully passed through its experimental period into an industrial and commercial reality

Unloading resin bonded assemblies from hot press (above). Roll of Tego, a resinous dry film adhesive for plywood (below)

ABOUT 1870–80, PLYWOOD BEGAN TO ASSUME a real identity as an industry, one of its first major products being perforated seating for chairs, benches and settees. Gradually, the furniture industry came to recognize the immense opportunity afforded by plywood to make artistic furniture both more attractive and more substantial, as well as less costly. Some of the advantages of plywood over solid wood are:

1. It distributes wood strength in all directions where solid wood is strong with the grain and weak across the grain.
2. It is non-splittable.
3. It reduces wood shrinkage and swelling to a minimum.
4. It increases the strength/weight ratio several fold, or greatly increases the strength for the same weight or thickness.
5. It makes possible the use of fragile but attractive face veneers that cannot be duplicated in solid wood. From an economic standpoint twenty or more thin sheets of veneer will result from the same thickness that would make an inch board.

2

1 3

1. Desk by Kittinger Co., with 2 ply faces by Mengel Co. 2. The "Tom Blake" surfboard, built with resin bonded plywood by the Robert Mitchell Mfg. Co. 3. One of the houses of Tego-bonded plywood erected at Louisville, Ky., by Gunnison Magic Homes, Inc. An advanced type of prefabricated house, it represents a basic design which may be decorated or expanded to suit the owner. Resin bonded plywood is used inside and out for its extreme durability, light weight and economy

Wood adhesives

Plywood naturally depends for its quality and properties to a great measure on the adhesive with which the plies, or veneers, are held together. The procession of wood adhesives, or glues, used through the centuries is neither long nor varied. Animal (bone and hide) glues were undoubtedly the first, and with fish glues probably covered the wood adhesive field, except for one or two rare mentions of casein, until toward the end of the nineteenth century, when vegetable (casava), casein, albumin, sodium silicate, soy bean and other lesser known adhesives found their place in the wood working program. The nearest approach to waterproofness, and hence durability, was albumin, coagulated under heat and pressure, but the mixture was hard to handle and difficult, if not impossible to standardize. Casein with high lime content was the most practical approach to waterproof requirements, but could scarcely qualify as more than water-resistant.

No known wood adhesive, however, was really waterproof, consequently plywood was definitely barred from use in all weather exposed uses, and greatly limited in its applicability to semi-exposed (partially protected) work, such as interiors, partitions, and the like.

Development of resin-film adhesive

The plywood and glue industries were both struggling to devise formulas or methods that would improve the water-resistant qualities of the known adhesives, and it was fondly hoped that such improvements would eventually uncover a real waterproof adhesive. Many combinations were tried and offered to the plywood manufacturers, but they fell far short of the goal.

The solution of this problem, by the utilization of phenol-formaldehyde resins in the form of Tego resin-film (Resinous Products & Chemical Co. Inc.), which today is extensively used in the plywood industry, has not been such a simple problem as it might appear on the surface. As early as 1912, 24 years ago, when phenol-formaldehyde resins were beginning to find successful application as binders in molded and laminated products, their possible use as an improved and waterproof bond in plywood manufacture very naturally suggested itself. From that date on, the technical literature, and more particularly the patent literature, is dotted with proposals to utilize phenol-formaldehyde resins in various forms for this purpose: as solutions of still soluble and fusible resins; as aqueous dispersions of the resin in colloidal form; and as dry powder which could be applied to the wood without any solvent. Finally, as long ago as 1918, it appeared in the form of a thin sheet of paper or other cellulose material impregnated with a phenol-formaldehyde resin.

If one were to accept the statements of many of these patents, and of not a few published articles, one might conclude that the utiliza- (*Continued on page 64*)

DECORATING WITH LIQUID METAL

by BISSELL BROOKE
American Catalin Corp.

Explaining a new process of pouring metal decoration in the form of inlays into cast resin materials which have been fabricated to shape but not finished

AN EXCLUSIVE PROCESS OF METAL INLAY, expected to revolutionize the styling of plastic accessories, is a recent development by the Birnbaum Novelty Company, makers of Catalin accessories. Perfected on a production basis after three years of detailed experimentation, the new designs, in which metal is embedded in plastic buttons, buckles, and dress ornaments, are now being shown to jobbers for introduction in the Palm Beach and early Spring collections.

Unique in the history of plastic fabrication, this form of metal application combines the two substances into a smooth, fitted whole. Until now, metal was wound around the plastic, fitted into grooves, or screwed on the material, with the obvious disadvantages of loosening, slipping out of the groove, or becoming unscrewed. The new inlay is poured in a molten form into channels, cut in the cast resin, and allowed to harden securely in the substance. Besides this, pouring the metal offers greater variety of design and manipulation. Any figure that can be carved in the plastic may now be executed in metal.

Original inlay work of this type was discovered in Europe. It never progressed beyond the stage of hand work, however, which made the price prohibitive for manufacture on a production basis. Foreign samples were studied by the Birnbaum Company, and tests were made to find a metal equally suitable for machine production.

Most metals, particularly white metal, proved wholly impractical due to the high temperature at which it had to be poured. The intense heat charred the cast resin and destroyed items that did not take the "pour" perfectly. The metal finally adopted is one that can be poured at an almost lukewarm temperature, having no unsatisfactory effect upon the plastic. Hence, if the metal does not go into the channels successfully, the plastic can be dipped in a special solution which removes the metal without injuring the cast resin. The pouring may then be repeated on the same piece.

The process itself is a simple one. Taking a cast resin leaf buckle with silver veins for example; this plastic is carved in the desired shape, and the veins cut in slender grooves. While the plastic is still in its rough state, the molten metal is poured into the vein channels, smoothed off, and allowed to harden. The buckle is then rolled and polished, giving a high luster to both plastic and metal, and producing a perfectly finished surface.

Three methods of inlay are used. In the first, grooves are cut on the surface of the plastic, a sixteenth of an inch in depth. The metal is poured, and the surface polished and smoothed. On a bow shaped buckle, straight silver lines of varying lengths are shot out at angles, forming a smart futuristic design. In this process, while the metal is secure, it is not actually anchored to the plastic material.

In the second method, holes are bored through the material at certain points in the design. This definitely fastens the metal to the material, making the application permanent. A good example of this is a jade green button and buckle ensemble, inlaid with a flower design. The small, metal-filled holes are placed to resemble buds in such a way their purpose is concealed.

The third method is to (*Continued on page 63*)

AUTOMOBILES OF 1937

There is a marked increase in the use of acetate steering wheels and a tendency toward additional molded parts

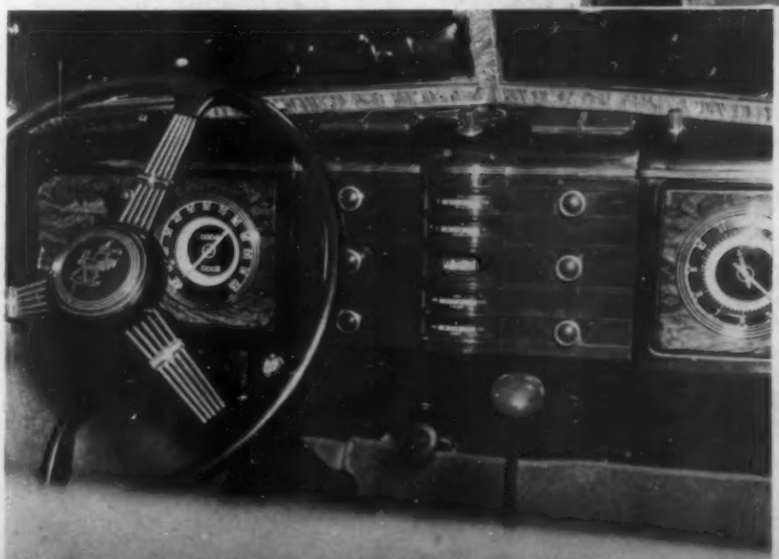
AMAZING AS IT MAY APPEAR, THERE WERE no all-molded automobile bodies displayed at the recent National Automobile Show at Grand Central Palace in New York. Not even a plastic fender put in an appearance that I could see.

Plastics were used more generously than a year ago, however. Last year, for example, there were but two steering wheels of acetate, this year there were at least eight. Besides those of Cord and Hudson which appeared a year ago, Buick, Oldsmobile, Pontiac, Chevrolet, Studebaker, and Willys have added those colorful wheels and judging from the comments of an enthusiastic public, the old black wheel which has so persistently remained all these years will soon take its place in oblivion with the brass horn with its rubber bulb.

Quite the most prominent new use of plastics is the central unit of the Graham Paige instrument panel which is molded of acetate and is illustrated below. It is rich brown in color and matches the control knob inserts and ashwell covers above, which are of the same material. Defrosting devices have opened up a new field for plastics in automotive construction and they are quite generally used.

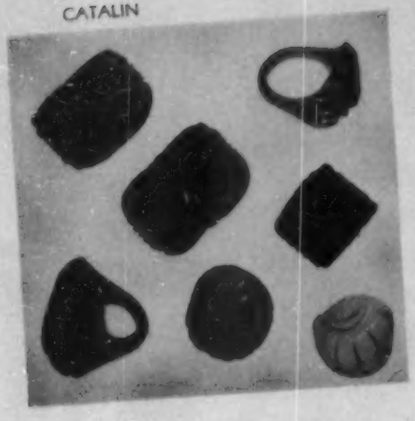
Oldsmobile has a six-inch bezel around its speedometer and clock combined with a ring of chromium to accentuate its feeling of modern design. Clock numerals cut out of the chrome and backed by a colored transparent material are lighted by the indirect lighting of the instrument panel to indicate time at night. These bezels are lighter in color than the instrument panel.

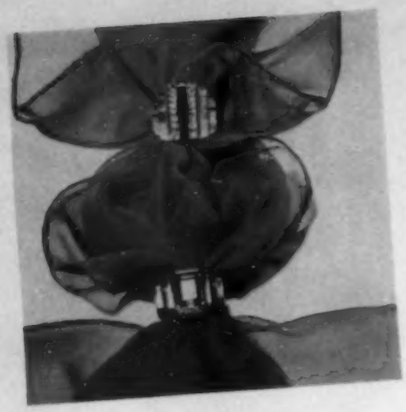
Hudson and Terraplane have (*Continued on page 62*)



The open door of the Cord car (above) reveals a white plastic wheel and window control knob. Interior of the new Chevrolet (center) showing its mottled acetate wheel. The Graham Paige instrument panel (below) is of acetate as are the ashwell covers and knobs above it

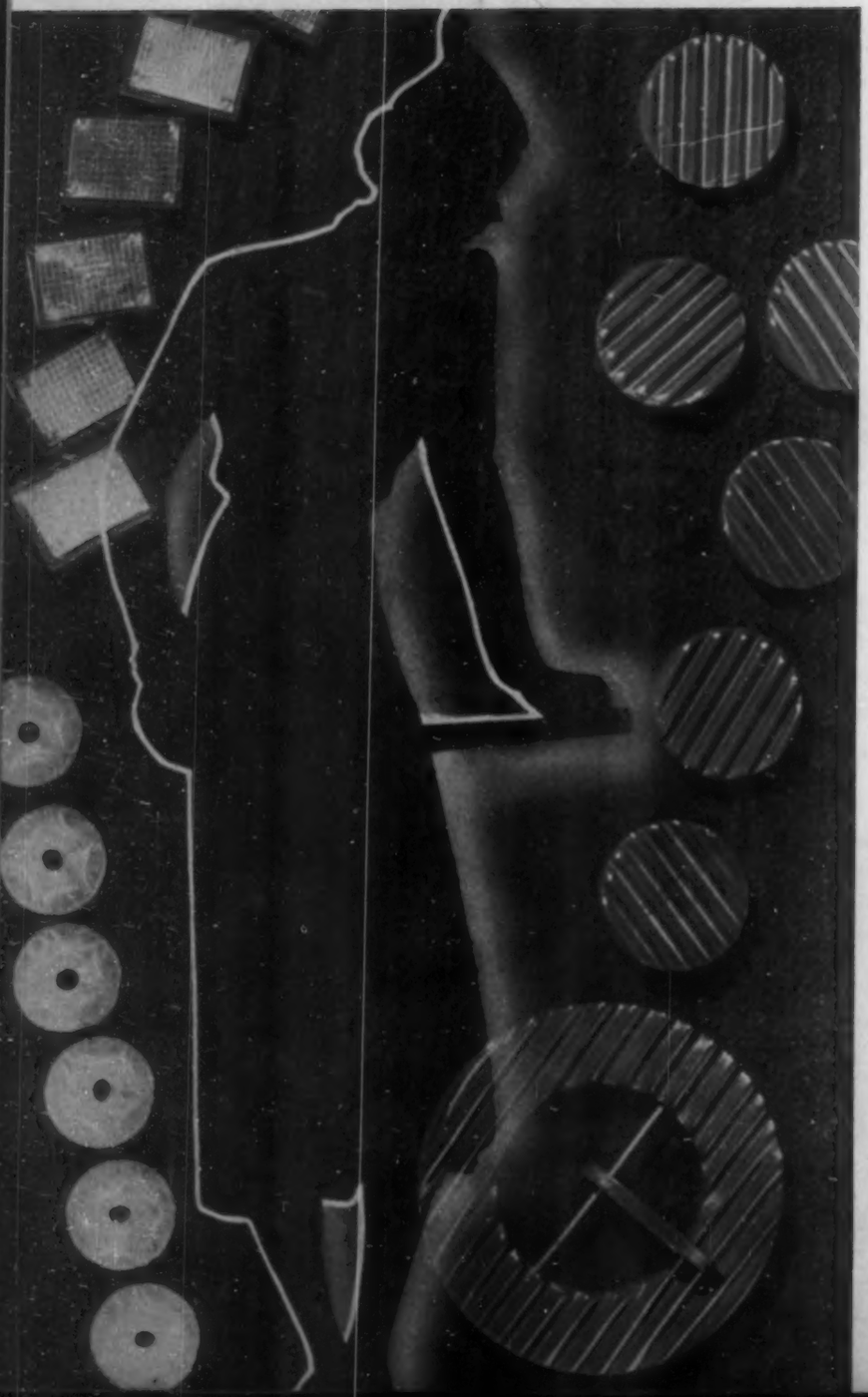
PHOTOS COURTESY NEW YORK TIMES





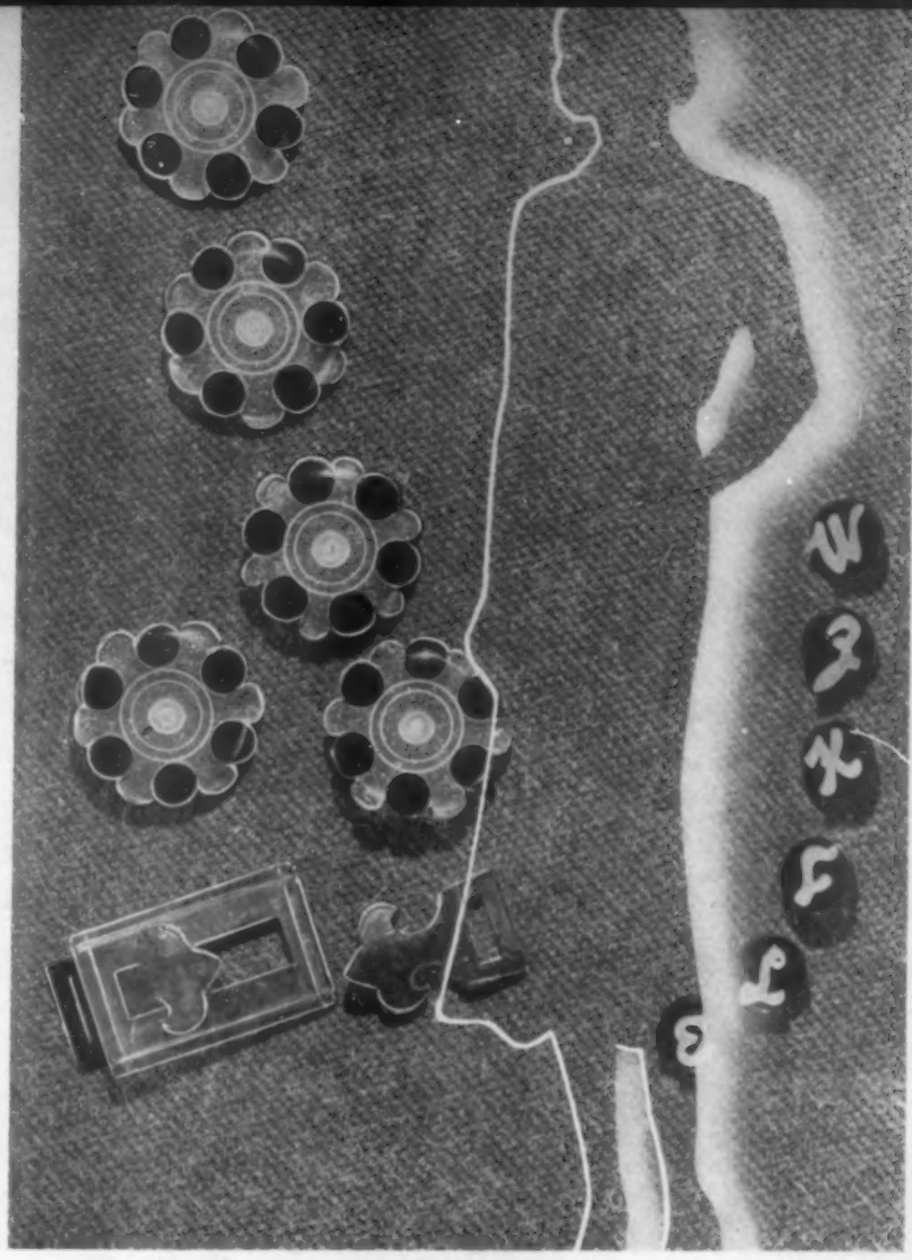
PLASTIC MODES

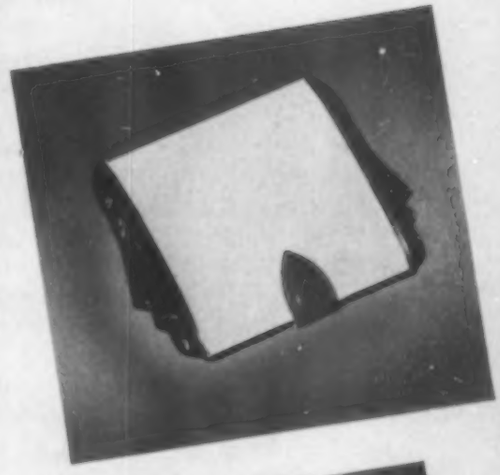
by EVE MAIN

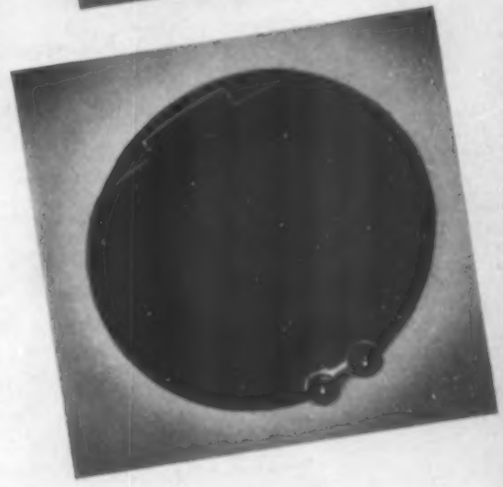


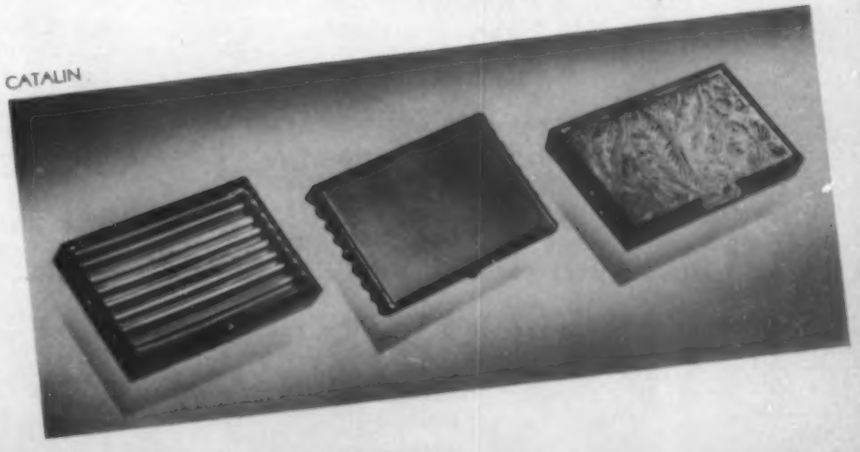
JEWELRY MANUFACTURERS ARE ringing in a new style note in costume jewelry with plastic rings for every occasion. It's bulk that counts whether for sports, dinner, evening or novelty rings—all different, but all big. They range from rectangular plaques of cast resin an inch and a quarter long, carved in floral patterns and modern angles and ridges, to more formal types set with simulated rubies, sapphires and rhinestones. These styles are shown in a variety of bright colors designed to complement any costume. Rings from Uncas Mfg. Company, Mazer Bros., and Cahn & Company.

There's no limit to the inventiveness and imagination of button makers and surely, Grandmother's button box never boasted such a conglomeration of unusual colors, shapes and sizes from which to choose. Illustrated on this page and the next are a few examples of buttons and buckles that promise individuality to the simplest frock, suit or coat. Book-shaped brown cast resin buttons have a checked gold metal panel on the top; big round translucent balls are intricately carved; deep ridges appear on flat round buttons available in all colors; scalloped edge, gold flecked cast resin buttons have opaque brown spots for decoration; a buckle of unusual design is fabricated from tortoise shell plastic material; and round black cast resin buttons are mounted with red plastic letters to spell out a name or initial for gals who like to be









labeled. Buttons from the Paristyle Button Company.

Holiday shoppers hot on the trail of "the appropriate gift" for sister or friend, pounce gratefully on smart new compacts. Mary Dunhill dresses up a white enamel compact with cast resin profiles on either end carved in the modern mask manner. The featherweight "flapjack" compact weighing only three ounces is made entirely of cast resin and comes in black, cornelian, wine, green, lapis blue, tortoise and brown. From Gaess and Hollander.

A decided inducement for feminine smokers to carry their own cigarets are these trim cigaret cases. The first is of transparent cast resin with ridged cover and banded with colored plastic material. The second, a moire patterned gold metal case has cabochon type ends and clasp of lapis blue cast resin. The third, a transparent case with delicately carved cover is banded in a variety of plastic colors. From Gaess and Hollander and the Evans Case Company.

EDITORIAL COMMENT

OBSERVING NOSE DIVES OF CONTEMPORARY publications into the depths of plastics technology is amusing if not altogether enlightening—and satisfactory to readers in search of the truth. Writers dip enthusiastically into the kettle of mystery, grope around a bit and pull out the funniest things which they display proudly as authentic information.

An article in a general circulation magazine, recently expounding the ingredients of plastics, said: "Bright, sturdy and useful articles are all of them—yet they were made from sour milk, from the fuzz of cottonseeds, from carbolic acid or from thin air." What else can this indicate but a writer who must turn out copy at all hazards on a subject of which he has taken the time to learn but little. To adopt his formula, we might paraphrase his bright, newsy little story by describing it as made from words, phrases and imagination with at least one ingredient in common with the plastics he describes —thin air.

LATER IN THIS SAME STORY WE LEARN THAT one of the well-known phenolic molding compounds (identified by its trade name) is "black in color which largely restricts it to industrial use." No indication is given that this material may be obtained in more than ten different colors besides black and that its use in decorative applications is rapidly approaching its output for industrial purposes.

Laminated phenolic is described as a material "into which canvas or other fabric is pressed for greater strength and insulation." While this statement bears a semblance to truth, it is hardly an adequate description of laminated material, nor one which could possibly be helpful to the lay reader who might be considering the use of such material.

Another *bon mot* appears in this writer's conception of urea materials, of which he writes: "One of the newest compounds to startle the market is the urea plastic, a mixture of nitrogen—snatched from the air—with carbon dioxide and formaldehyde. Unlike the others, this is manufactured first as a powder and then molded." This gives us our first inkling that ureas are the only molding compound available in powder form but he fails to relate just how phenolics, acetates, furfural and other compounds are introduced into the molding press.

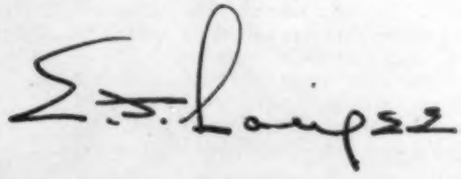
WE HAVE NO QUARREL WITH OTHER PUBLICAtions who treat on the subject of plastics. No one can be blamed for his enthusiasm. It is a trait of human nature with recognized value. Its value, however, is measured by quality rather than quantity and can be immeasurably elevated and expanded when tempered with a certain amount of restraint and common sense. No publication should be condemned for its enthusiasm for plastics in which there is such vast reader interest, but when one adopts the chore of spreading *apparently* helpful information it should assure itself that the information *really* is helpful before it *shoots the works*.

"Meanwhile," says one writer, "the art of fabricating plastics is advancing steadily. The new automatic injection method of molding, in which a plastic almost ready to harden is forced under pressure into the molds and can be ejected in a few seconds, a finished product, is a case in point." I only hope his plastic *almost ready to harden* is not of the thermosetting variety, else he'll have a mess.

NOTHING IS MORE CONFUSING TO A MANUfacturer, an engineer or designer who is considering the use of plastics for the first time than the half-truths and essentially misleading tid-bits which he picks up in the course of his everyday reading and accepts as facts.

In a recently reported survey of manufacturing trends in the automotive and aircraft industry, plastics were dismissed with the statement "Aluminum phenolic-resin varnish is gaining in popularity." Yet, we know two new factories of considerable size are being built to supply the demand for transparent plastics created by their peculiar advantages over glass in aircraft manufacture. The theme of safety which marks the sales campaign of nearly every automobile manufacturer has prompted the increased use of safety glass as standard equipment until it is difficult to find a single instance where the use of plastic film has not contributed its share to this campaign and trend. It is common knowledge, too, that the use of plastics in body design and decoration is increasing rapidly, yet these established facts were conspicuously omitted from this survey.

IT PROBABLY NEVER WOULD HAVE OCCURRED to us to designate plastics as "Non-metal Materials" if we hadn't seen them included under this heading in a contemporary business journal. Plastics, it would appear from census figures recently released at Washington, have sufficiently established themselves to justify their designation as such. Listing them in any other way is an evasion of this fact. The paper which that journal uses in its publication is also a "non-metal material" yet I doubt that, in an attempt to describe it, they would designate it just this way.



CARLETON ELLIS

HORTON SPITZER

IF WE WERE GIVING MEDALS. . . WE'D PIN ONE ON. . .

JOHN G. SWANSON

Carleton Ellis, research chemist, because he indicates his enthusiastic belief in the future of plastics by maintaining a staff of fifteen chemists working in the extensive research laboratories of the Ellis-Foster Company; because, as author, he has contributed substantially toward the development and understanding of these materials through "The Chemistry of Synthetic Resins," 1935, and "The Chemistry of Petroleum Derivatives," 1934, and several other books on chemical subjects; and finally because, among other products, he has been instrumental in developing the synthetic resins known as Rezyls, which are the phthalic glyceride type of resin, and urea formaldehyde molding compounds.

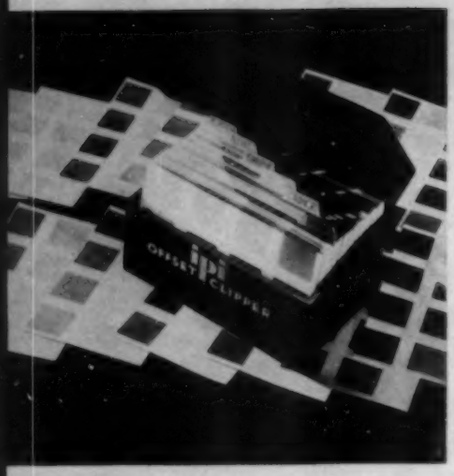
Horton Spitzer, vice-president of the Plaskon Co., Inc. because he has achieved his present position through a series of progressive steps which began at the bottom; because upon graduating from Sheffield Scientific School, Yale University, he became associated with the Toledo Scale Co. in time to get into the thick of the development of its new urea material during the pilot plant stage; because he was placed in charge of the plant of Toledo Synthetic Products, Inc. the first few years of actual production, later becoming Eastern representative and sales engineer; and finally because upon the change in name of that company to Plaskon Co., Inc., he became vice-president in charge of Eastern sales.

John G. Swanson, because since 1913 he has pioneered constantly in the molding field; because he inaugurated the molding department of Kellogg Switchboard and Supply Co., and because he continually added to his experience and knowledge of plastics through his connections with Dayton Insulating Die Co., which was reorganized in 1918 as Kurz Kasch Co., as organizer of the molding department of International Insulating Corp., later renamed General Industries Co., then with Reynolds Spring Co., Boonton Molding Co., Celluloid Corp. and Regalite Corp.; and finally because he installed the plastics department at Leviton Mfg. Co., and as plastics engineer has brought this department to the point where it is one of the largest users of plastics in the New York area.

PLASTICS' PROGRESS

1

4



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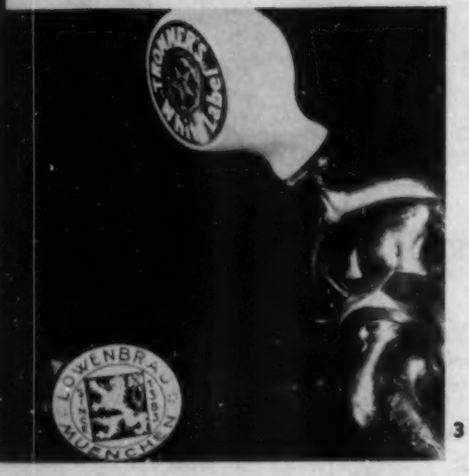

3

6

1. Pyralin is used in rod form for these semi-transparent drawing pencils. Made by the South Bend Drill Co., they are available in varied colors and with different thicknesses of lead. The lamp shade in the background was molded of Beetle in a beryllium-copper mold by the Gorham Co.

2. A molded Textolite box contains the International Printing Ink Corp.'s card-index guide to color and offset printing inks. The box is black and has the trademark "IPI" stenciled on in red, while "Offset Clipper" appears below in aluminum. This box was obtained from a stock mold of General Electric Co.

3. Catalin beer knobs screw on to the taps, and on the front of the handle is cemented a circular replica of the beer brand label. These cast handles quickly identify the beverage on draft and retain their lustrous finish indefinitely. Made by the Krest Manufacturing Co.

4. The G. E. Hotpoint coffee maker has pyrex glass bowls, and a china drainer assembly held in position by a corrosion-proof metal spring, the only metal part coming

in contact with the coffee. It is equipped with a lifting handle of heat-resisting Textolite, and a molded plastic coffee measure

5. These Plaskon lipstick cases answer a woman's plea for a case which will not permit dirt, powder and loose tobacco from her purse to penetrate to the stick itself. The J. C. Allen Co. furnishes these holders with a tight fitting top available in many different colors

6. Novelview, a new compact stereoptican through which specially made movie film is reeled, has an entirely molded case of brown Durez. By holding the device to the light and turning a small button underneath, three-dimensional views of greatly magnified proportions can be studied

7. Here is an oiler called Presto that looks like a fountain pen and whose oil chamber is made of Pyralin. Equipped with a visible oil supply, a screw cap that does not leak and a pocket clip, this device made by the V. R. Hall Products Co. is convenient and useful for oiling typewriters, office equipment, etc.

8. No trouble for the fisherman to find his favorite fly in this transparent box of Pyralin. There are eight compartments—all transparent—where flies are kept in perfect order, yet are always in plain view. The box is light in weight and practically unbreakable. Made by the Fairy Form Co.

9. A container recently adopted by Otis Clapp & Son Inc. has raised lettering on both top and bottom. The box is molded by Terkelsen Machine Co. of Bakelite with the company's coat of arms on the top, while the bottom contains instructions and descriptions of the contents

10. Stamp collectors will like this measuring device which is molded of Durez in one piece by Imperial Molded Products Corp. A revolving scale, a powerful magnifying lens, a measuring scale in inches and millimeters and a molded-in tray for holding stamps are the outstanding features of this piece

11. The Taisho Pharmaceutical Co. is packaging toilet cream in a two-colored molded container. Within this housing is a glass jar which holds the preparation. The moldings, which when empty serve as twin inkwells, together with the Bakelite base which is received upon purchasing the cream, provide an attractive desk set

12. The new Airite desk set made by the Sengbusch Self-Closing Ink Stand Co. contains a radio, electric clock, and combination self-closing ink stand and fountain pen holder, all molded of Bakelite. Designed by Barnes and Reinecke, and molded by the Chicago Molded Products Corp.

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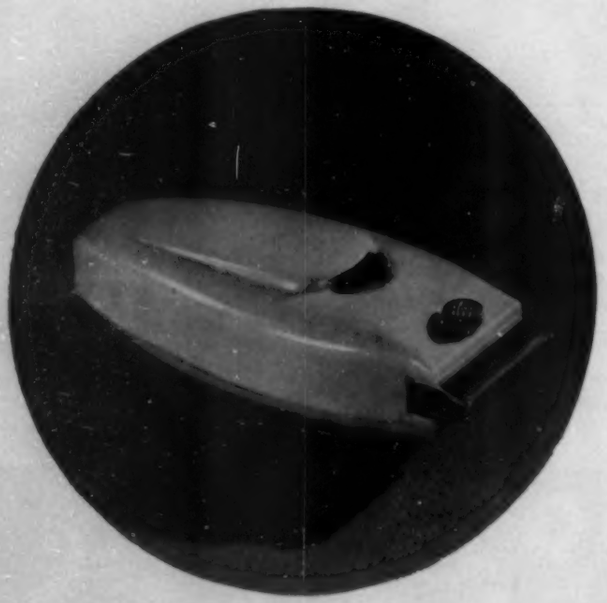
PLASKON

MOLDED COLOR

SCHICK RAZOR:

In 1935, some 220,000 Americans decided that the luxury and ease of an electric shave was bought cheaply for life at $15—the cost of a shiny new Schick. With the original electric dry shaver just becoming well known to the general public, 800,000 will be sold in 1936. And helping to swell next year's total are clean, colorful Plaskon casings on the newer Schicks.

Some women and many men objected to black razors. This fact was unearthed last year by Schick fact-finders. The selection of Plaskon—Molded Color—for the present models not only removed the cause of this prejudice against the razor and improved its general appearance, but also brought important dielectric advantages to the casing. Molded in ivory and burgundy-red Plaskon by the Shaw Insulator Company, Irvington, N. J.



AYER COSMETIC JARS:

As neat a dressing and clothes case as you will see this Xmas is this Harriet Hubbard Ayer kit which is fitted out with creams, powders, rouges and nail polish, etc.—all in Plaskon jars. Women like it instinctively and then like it more when they find that besides adding dash and color, the air-insulated Plaskon jars keep the cosmetics in perfect condition.

Coltrock-Supreme and Molded Color are the materials used in making these jars which are the first completely satisfactory plastic cosmetic container. Their advantages over the opal glass containers are: 70% less weight, greater protection and a specially designed closure that prevents cross-threading. Another nice thing is that the manufacturer's name can be easily molded right on the jar to remain there as a permanent advertisement.

Colt's Patent Firearms Company of Hartford, Conn. is the molder and developer of the jars.

MERRY CHRISTMAS DECEMBER...1936

GRUEN WATCH BOX:

Once again it becomes our pleasant duty to report and show a Molded Color watch box. The Gruen Guild is the latest great maker to decide that Plaskon, of all the plastics, makes the finest, all-round watch display box. With what results? The new light-fast Plaskon boxes are now commanding permanent, prominent space in dealer windows. Their brilliant blue color is attracting more people to inspect Gruen watches. More Gruen watches

have been sold since Plaskon's coming. Look at your package and ask yourself if you couldn't profitably put Molded Color to work. We'll gladly send you complete information and samples of notable Plaskon packages that would be suitable for your product.

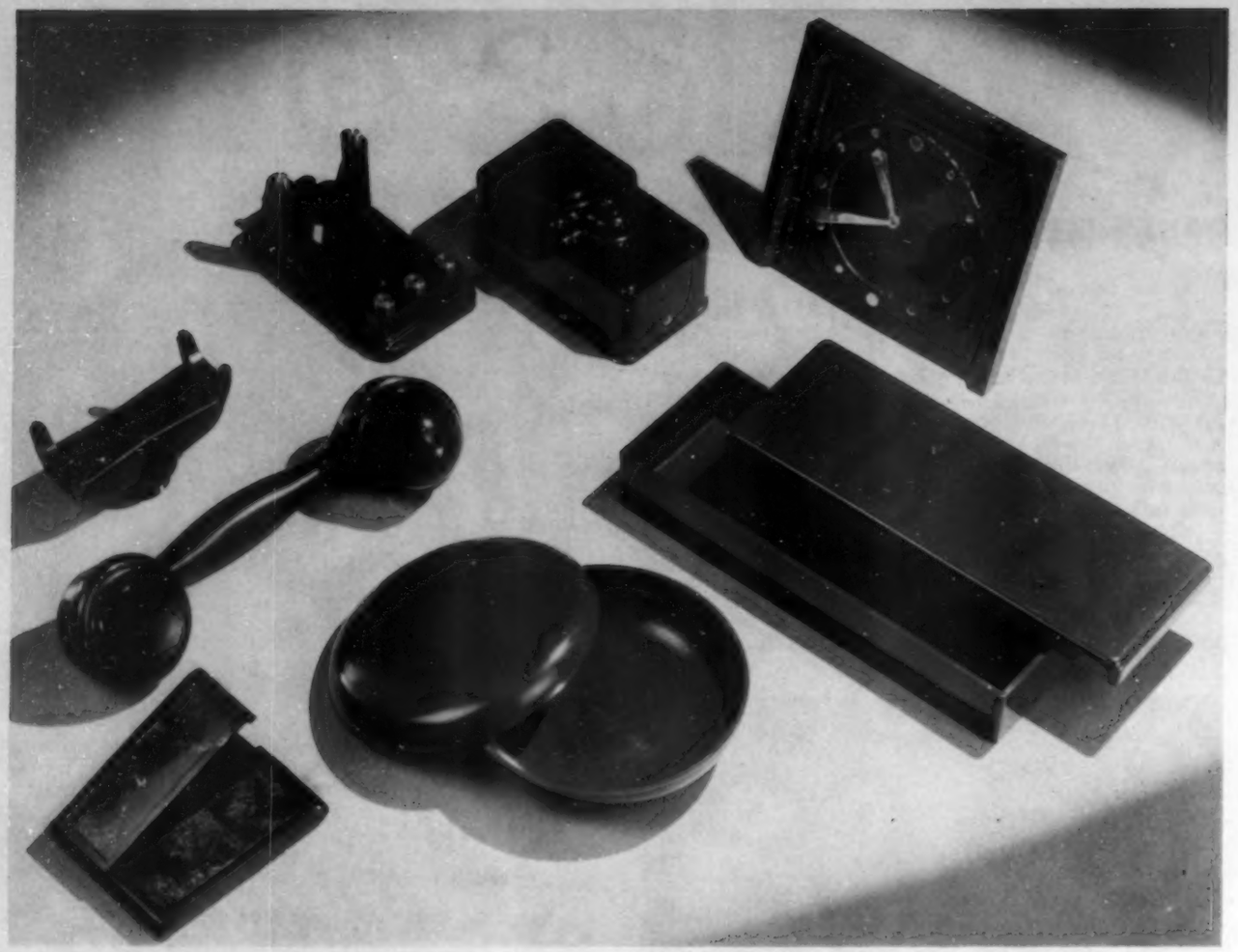
The Gruen box is protected by patents and patents pending and is custom molded by Rathbun for Electric City Box Company.

SPARKLET:

Radically altered in both construction and appearance, the New Improved Streamline Sparklet Syphon, which quickly and easily supplies enough club soda for a regiment of drinks, boasts of a newly designed head composed of metal and plastic. This head consists of two intricately molded parts held tightly in place by encircling metal bands at top and bottom, so threaded that when assembled they conceal an otherwise unattractive die casting.

Important factors determining the material to be used were: economy, resistance to alcohol and water, neatness, lack of odor and attractiveness with particular respect to permanence of color and range of color. The Plaskon head is molded by Boonton Molding Company, Boonton, N. J.

PLASKON COMPANY
INCORPORATED



FRENCH MOLDINGS IN OUR PERMANENT EXHIBIT

AMONG OUR DISTINGUISHED VISITORS RECently was M. de Laveaucoupet, manager of Société Industrielle des Comprimés de l'Ouest, who brought the above moldings to be added to our Permanent Exhibit of plastic products. This molding company, located just outside Paris, devotes the major part of its efforts to electrical parts and two very good examples of these are illustrated in the upper left corner of the accompanying illustration.

At the upper right is a modern clock with chromium hands, and numeral indications which are molded in. The works are mechanically propelled and are fastened into the molded base at the back. In the lower left corner is an ingenious cigaret case with an all plastic hinge which opens at either the upper or lower half for convenient access to the cigarets without spilling them. Both halves may be opened for cleaning and filling.

The round powder box in the lower center is a delightful shade of soft green with a friction fit cover and the box at the right has exceptionally heavy walls and close fitting cover and is molded of a dark maroon phenolic.

We are happy to add these examples of French moldings to our Permanent Exhibit where American molders and manufacturers can examine them at their leisure. A number of English moldings have also been added and are illustrated on the following page. This Permanent Exhibit is open daily and is being visited freely by our readers who come to us for plastics information and who wish to learn what is new and how they can take advantage of these new materials in their own manufacturing activities. American molders and fabricators are urged to send us their interesting developments each month to keep the Exhibit "alive" and interesting. There is no cost for such displays and there are no strings attached. Our Exhibit room is a common meeting ground for molders, fabricators and those manufacturers whose interests lie in securing dependable information about the materials and those in the plastics industry who can supply their needs. We invite our readers to take advantage of this display at their convenience.

BRITISH MOLDER VISITS AMERICA

G. NORMAN HIGGS

Editor Modern Plastics:

I should very much like you to give as much publicity as possible, especially to those connected with your Moulding Industry, as to how deeply I appreciate the reception that has been given me during my visit here.

The wonderful feeling of genuine friendship shown me throughout my tour, not spasmodic, but general and without exception, has been nothing short of amazing and entirely different to my anticipations. In fact, I am of the opinion that those in authority connected with our respective nations have little idea of this state of affairs and that they should make more of these conditions.

On behalf of my Country, "Great Britain," my Company, "Synplas, Ltd.," in which I myself sincerely join, I wish to thank, through you, all those whom I have met for such generosity and good feeling which has resulted in my spending in America one of the most pleasant periods of my life.

Yours sincerely,

October 5, 1936 G. Norman Higgs

G. NORMAN HIGGS, DIRECTOR OF SYNPLAS, Ltd., a British molding concern located in the outskirts of London, paid his first visit to the States during the month of September. He sailed for England on October tenth, leaving behind him a wide circle of newly acquired friends and a splendid feeling of international cooperation within the industry. He came to see what American molders are doing and to compare their methods with his own. He wanted to learn, first hand, what progress was being made with new materials and new ideas. But further than this, he was as willing to give information as he was to get it with the result that his visit was as stimulating to many molders in this country as it was to him.

These coasters molded by Synplas, are cleverly lettered with contrasting color in the molding process

If you want to know what Mr. Higgs thinks about American molding plants, pull up a chair and listen in on this conversation we had one Sunday afternoon just before he sailed for home. Will you have seltzer or ginger ale? Well! Cheerio!

"What impressed you most, Mr. Higgs, about our plastics industry?"

"Well," he replied, "I was amazed at the cordial and friendly reception I received wherever I visited. I felt, you know, that I was a bit of an intruder. At first, I was timid about asking some of the questions I had in mind but your molders and material suppliers soon put me at ease and we got on splendidly. I soon found that they were as interested in how we do things in England as I was to learn how they are done here."

"How does molding technique in this country compare with that in England?"

"Very favorably, I should say. Although I notice that molders in this country are suffering much the same as we are in England from equipment that is becoming obsolete. Some of the firms in our country have allowed for this and others have had to shut down entirely. Improvements in plant have occurred so frequently during the last few years that it has been difficult to keep pace. With modern presses you can work so much more quickly and they are more economical to run."

"What do you mean by modern presses?"

"Well, what we use mostly are down-stroke semi-automatic pre-filling type presses with extra cylinders for working ejection and all that sort of thing. You see most of our presses come down by gravity and we use only the last half-inch of the movement under pressure. Ours is a comparatively new concern and we have installed only the most modern presses which is fortunate for us. We use only oil in our hydraulic system finding it better than water for the purpose."

"How do our molding shops compare with those in England?"

"Pretty favorably. There are large and small shops in both countries. Ours is not the largest in London but it is one of the more modern. It appears that your plants here are more crowded than ours. We have more room to lay out our products in course of manufacture. I don't want to be in the least critical because all have been so nice to me, but it seems to me that some shops are rather haphazard in their arrangement. Some of those I have visited are splendidly laid out while others appear jammed by comparison. Some of your shops are obviously more modern and are cleaner than others but all of them are busy which after all is important and encouraging. *(Continued on page 69)*

A group of phenolic and wood-filled urea moldings by Synplas, Ltd., of London. The stein, with a glass bottom, is molded in two parts which screw together

Stock molds

SHEET TWENTY-THREE

127. Oblong box with ornamented hinged cover. 6 7/16 in. by 3 3/16 in. 1 1/4 in. inside depth. 1 11/16 in. overall

128. Oblong box with lift-off cover elaborately designed. 11 in. by 3 3/8 in. Depth, 2 3/16 in. Overall height, 2 3/4 inches

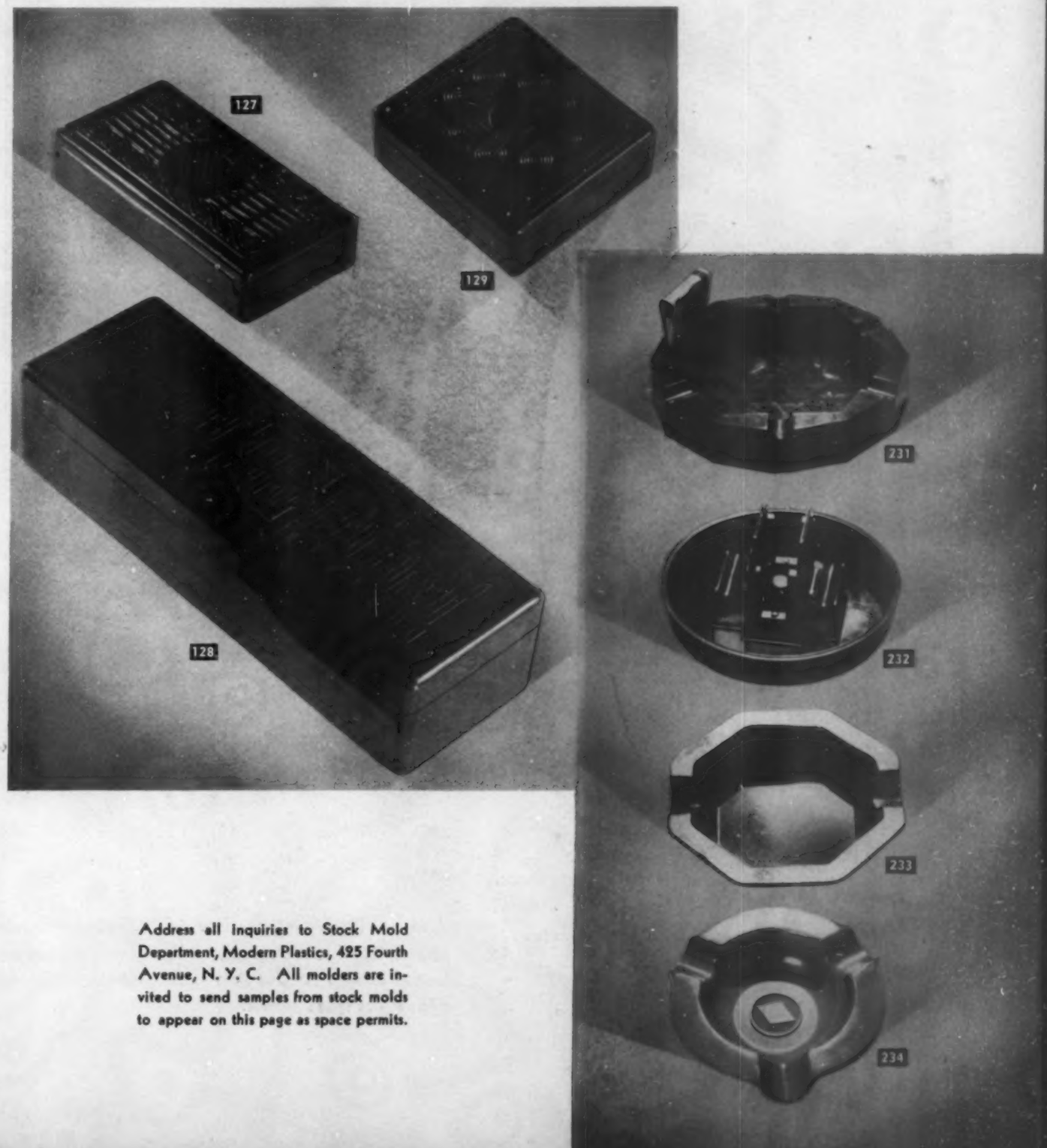
129. Decorated lift-off cover and box. 3 11/16 in. by 3 5/16 in. by 1 1/16 in. deep. 1 3/8 in. overall

231. Twelve sided ash tray with slot for paper matches. Inside is pentagon, 2 5/8 in. each side

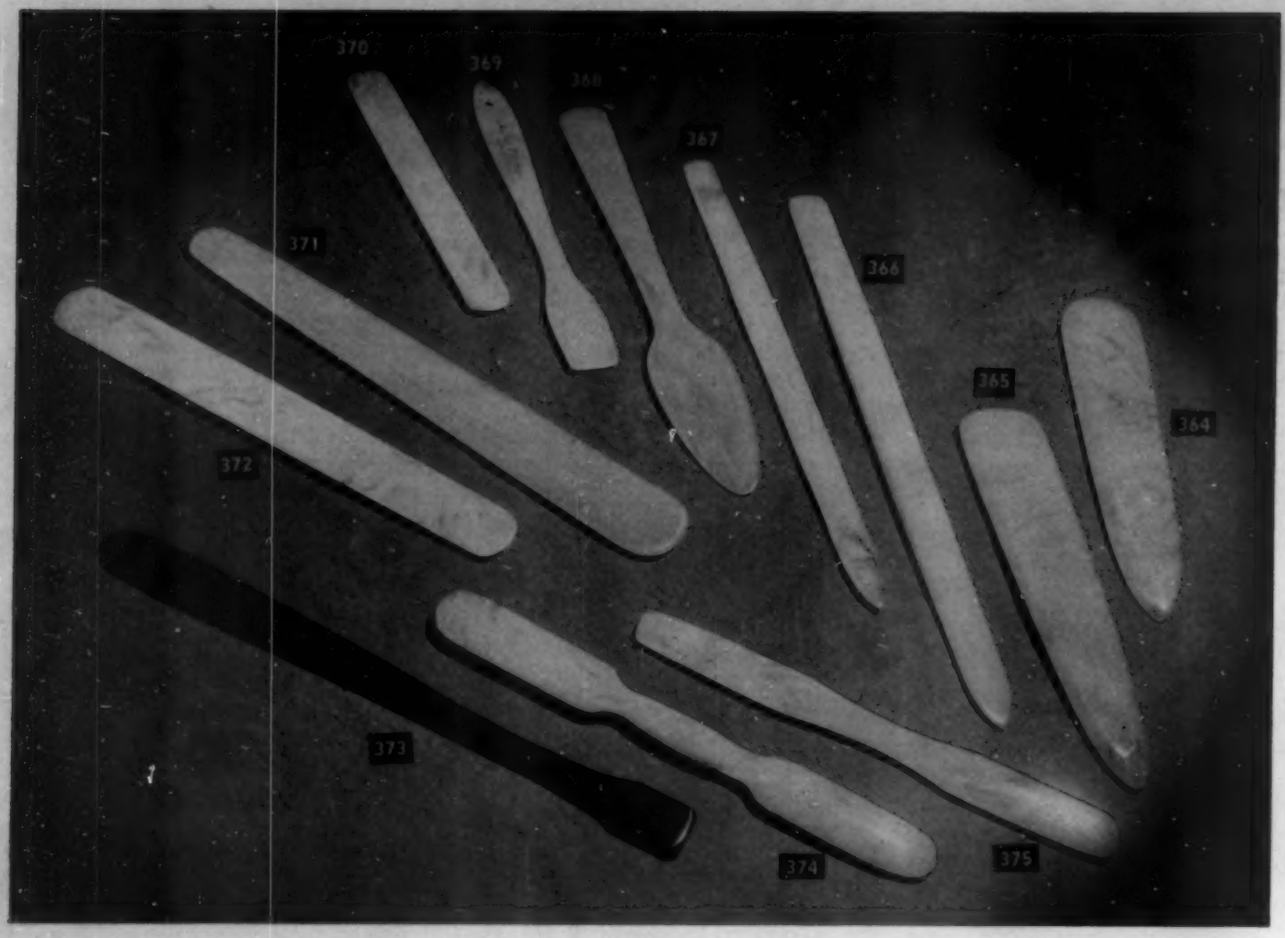
232. Ash tray with center piece for box of matches. 4 in. diameter

233. Octagonal ash tray. Each side 1/4 in. long

234. Bridge ash tray 2 1/4 in. diameter. Three cigaret rests



Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits.



CAST RESIN SPATULAS

SHEET TWENTY-FOUR

These spatulas are not from stock molds, but are stock items made of cast resins, and are available in a variety of shapes and colors. Interested executives, when inquiring, should write on their company letterhead and specify item number.

364. A scraping spatula 4 1/8 in. long, used for removing spots from clothing

365. Another scraping spatula, 4 1/2 in. long

366. Large double-end spatula used by dentists for mixing porcelain fillings. 6 7/8 in. long

367. Another double-end spatula, 6 in. long

368. Cheese spatula 5 3/8 in. long, used for spreading cheese, mustard, etc.

369. Cosmetic spatula 4 in. long used to take cream from jars

370. Cosmetic spatula, 3 1/2 in. long

371. Plait raiser used by the laundry trade, 5 3/4 in. long

372. Plait raiser 5 in. long

373. A paddle to stir drinks and cocktails, 5 7/8 in. long

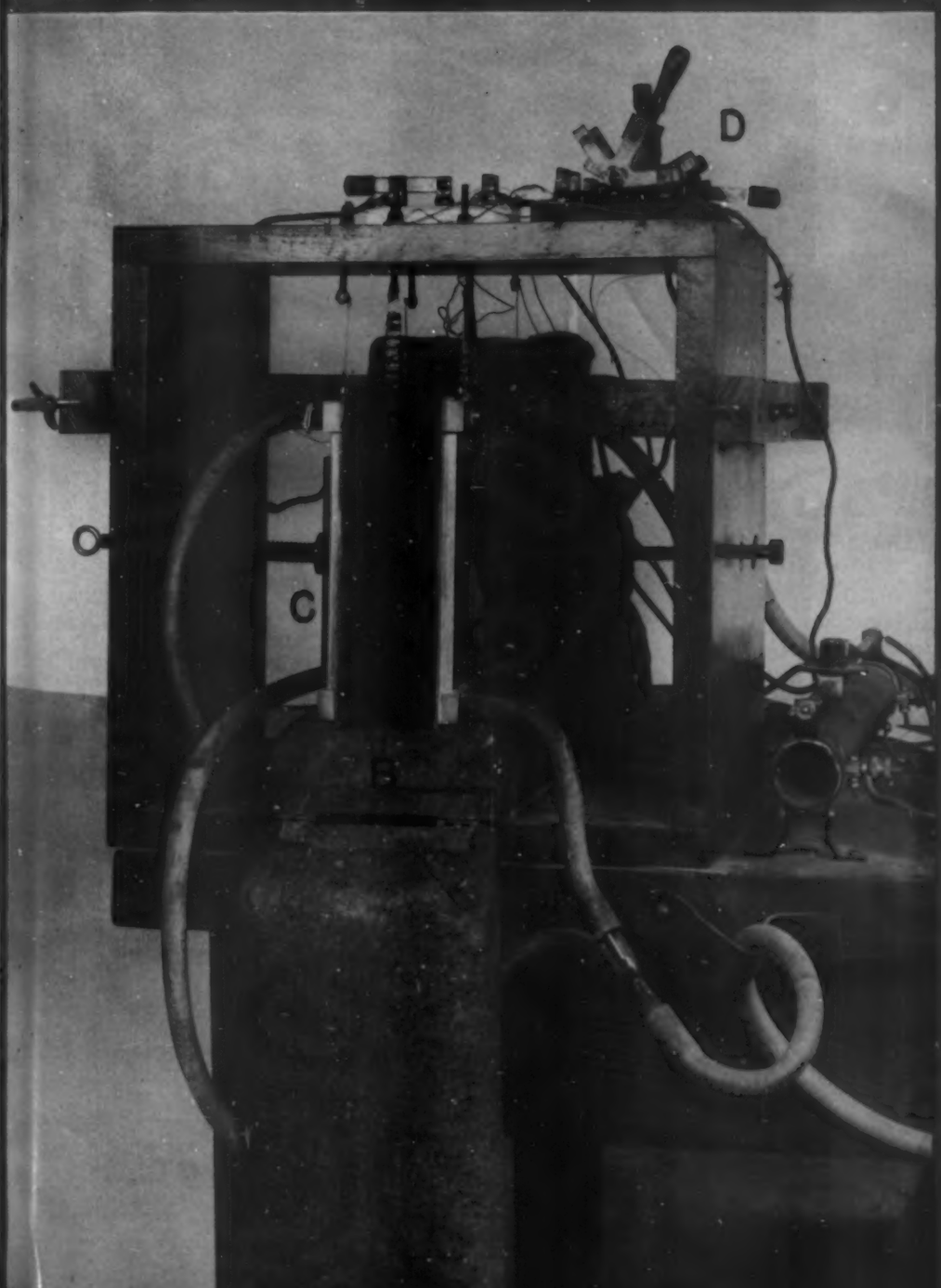
374. Laboratory spatula, 5 in. long, for mixing chemicals and so forth

375. Another chemical mixer, 4 3/4 in. long

Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits.

TECHNICAL SECTION

MODERN PLASTICS



WILD!

but the same force is brought under control with the aid of plastics by **DURITE**

A FEW REASONS WHY DURITE PLASTICS WERE CHOSEN FOR THESE CIRCUIT BREAKERS

1 *Properties inherent in Durite make the embodiment of revolutionary features of design practical for large scale economical production.*

2 *The high dielectric strength of Durite gives ample insulation wherever required between current carrying parts. Designs can be compact without endangering safety of operation.*

3 *Durite is light and strong. Weight can be kept down, for properly designed Durite parts are surprisingly resistant to shock, stresses, and chemical attack.*

4 *Production and assembly costs are reduced to a minimum. Covers, frames, and handles come from the molds with mounting lug inserts in position, and flutes and surface finish formed in one operation. All drilling and tapping operations are eliminated and only a slight buffing or grinding is required to remove fins.*

5 *The glossy black finish on the Durite is permanent. Continual handling will not cause the finish to dull, crack or peel off for it is an integral part of the molded article. This attractive and durable finish, moreover, is unaffected by moisture, oils and most common solvents, and is highly resistant to corrosive fumes, and weak acids and alkalies.*

DURITE Plastics TRADE MARK REG.

For automatic circuit breakers, where the forces of electrical power are brought under perfect control, the choice of leading manufacturers is Durite. Circuit breakers such as those illustrated here are literally the "safety valves" of industrial electric circuits. Their duty is to be ever on guard against temporary overloads that might damage costly equipment, cause delays or even temporary plant shut-downs.

That Durite is selected for such highly important equipment is ample evidence of its worth, but this is only one of thousands of applications where Durite has been the specified choice of leading companies for many years. If you have never had occasion to learn of their advantages, write and ask about these unusual Plastics by Durite, the exclusive producers of phenol-furfural resins.

DURITE Plastics TRADE MARK REG.

Frankford Station P. O., Philadelphia, Pa.
A DIVISION OF STOKES & SMITH COMPANY

TAKE ADVANTAGE OF THIS TECHNICAL SECTION

Talk given by Dr. Gordon M. Kline, Chief of the Organic Plastics Section, National Bureau of Standards, and Associate Technical Editor, Modern Plastics, at our First Annual Presentation Dinner in New York City on October 29, 1936

THE TECHNICAL SECTION OF MODERN PLASTICS needs no introduction to anyone who is actively interested in the plastics industry. To speak of the advantages of such a section in a plastics journal is akin to discoursing on the advantages of water for fish. The materials which are used in modern plastics have been and are continuing to be developed on the basis of chemical studies in technical laboratories. These developments have been described and exhibited many times as an outstanding feat of modern science. Certainly the production of some of these colorful, prize-winning plastics on display this evening entirely from gases which exist in the atmosphere we breathe continues to stir the imaginations of all of us. The production of synthetic ammonia from nitrogen and hydrogen and its conversion into urea by reaction with another gas, carbon dioxide, are well established processes in the chemical industry. Likewise formaldehyde is synthesized commercially by the reaction of carbon monoxide and hydrogen to yield methyl alcohol which is subsequently oxidized catalytically to the aldehyde. These two synthetic products, urea and formaldehyde, are then converted into a modern heat-hardenable plastic by interreacting chemically. Similar seemingly impossible changes of state could be described for the whole gamut of synthetic plastics. The fabrication of these plastics into molded products is a technical problem involving a combination of mechanical skill and a knowledge of engineering principles. Plastics used to be considered materials whose sole applications were limited to small parts which were required in large numbers. The development of larger capacity presses has, however, shown that housings and cabinets of considerable size and relatively limited demand can be advantageously molded of synthetic resins because of resultant light weight, corrosion resistance and eye appeal. Similarly, the injection molding press is a recent technical development which is expanding the possible markets for plastics and is necessarily of interest to every molding plant. In order to effectively serve an industry whose background is so inherently linked to technological progress in chemistry and engineering, a plastics trade journal must present these developments as they occur, and indeed, should strive to keep a little ahead of the field in the way of looking forward to new materials, machinery and applications.

The Technical Section of MODERN PLASTICS should be utilized by the industry for the presentation of properly protected facts and ideas which result from fundamental and applied research in their laboratories. The more the public knows about a product, the way in which it is manufactured and the work that is being carried on to improve it and to extend its applications, the greater is their interest and confidence in that product and in the manufacturer. Some companies have pursued a liberal policy with regard to the publication of such studies without apparent harm to themselves and certainly with an enhancement of prestige. Plastics have unquestionably caught the public's fancy, but this popular interest can only be maintained by continued activity in the laboratory. People are not so much interested in a particular application of a material, as they are in the way in which the product is made and the advantages which it offers for a given application. An ash tray is an ash tray whether it be of ceramic, metal or organic plastic composition, but if it was synthesized from ingredients originally derived from such diversified sources as coal, water, salt and a farmer's field, it becomes a topic of conversation. The desire of the public for technical facts regarding both materials and processes is evidenced by the establishment of private organizations to supply this information to consumers, by the increasing amount of space given to technical information in newspapers and to the establishment of such permanent exhibit centers as the one we are visiting this evening. It is the responsibility and also the opportunity of the manufacturers to build up this interest by the release of technical information pertaining to their materials. The Technical Section of MODERN PLASTICS provides an excellent medium for the publication of such articles, reaching as it does all branches of the plastics industry, representatives in closely allied industries and the general public.

The Plastics Section of the National Bureau of Standards also needs no introduction to many of you. Organized one year ago this month, we are still numerically small (2 members) but we have large hopes and ideas. Our experimental work has been largely centered upon transparent plastics for aircraft windshield, but we have been called upon many times both by government departments and by private firms and individuals for recommendations regarding materials suitable for a wide variety of applications. One problem which is causing us much grief at the present time is to find a duck-proof windshield for transport airliners. This sounds like a "Believe It or Not" story, but there have been reports of birds smashing through the (*Continued on page 68*)

A PROGRESS REPORT ON DENTURE BASE MATERIALS (1935)*

W. T. SWEENEY, A.B.** and IRL C. SCHOONOVER, Ph.D.***

I. Introduction

THE DENTAL RESEARCH WHICH HAS BEEN IN progress at the National Bureau of Standards for the last sixteen years has dealt principally with materials used in operative dentistry. This research was extended to prosthetic materials when the Bureau approved a request, passed by The House of Delegates of the American Dental Association at the 1933 Chicago meeting. The resolution requested the Research Commission to include a study of denture materials in its program at the National Bureau of Standards as soon as practicable.

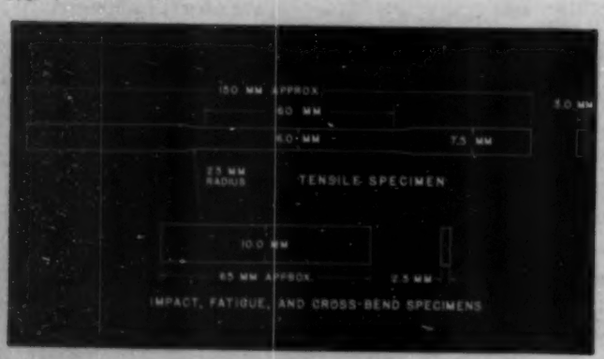
A preliminary survey was made at this Bureau by Commander Barber[1] of the Navy Dental Corps in 1934. The present investigation is an extension of this survey.

The need for the dentist to have some method other than clinical for judging the relative merits of different materials is apparent to anyone who reviews the literature and who is familiar with the experience of the profession. Glowing advertising claims followed by a short life of so many of the materials, sold to the profession during the last few years, have created bitter disappointments. During the last ten years more than thirty different trade brands of materials, other than rubber, have been offered for sale to the dentist. The scheme of having the dentist test all of these materials clinically has been unfair to both dentist and patient and has been very expensive.

This research was started with the object of developing a set of tests, and test methods, which will satisfactorily establish the suitability of a denture base material. It was soon found that progress would be slow, and the answers to the problems confronting the dentist, relative to the use of denture materials would come only after extensive tests and test procedures are standardized.

(*) A report to the Research Commission of the American Dental Association, which has been published in J. Am. Dental Assoc., Vol. 23, p. 1498, Aug. 1936.
(**) Research Associate of the American Dental Association at the National Bureau of Standards.
(***) Assistant Chemist, National Bureau of Standards.

FIG. 1



The lack of information on what physical properties are essential for satisfactory dentures has materially retarded the investigation.

This progress report gives some of the physical and chemical properties of representative types of denture bases studied. The difficulties in defining a group of materials which in general occupy a position somewhere between the elastic solids and viscous liquids are numerous, chiefly because testing procedures are not available to accurately define these materials. Thus it seems necessary to know where to classify each material before a set of tests can be used to satisfactorily describe its actions under oral conditions.

Materials which have been relatively satisfactory for a long period of time, like the rubber bases, may be used as a preliminary criterion in such an investigation. Test methods which will define the properties of rubber and compare them with other materials are being gradually developed. Of course, some properties of rubbers are not desirable and, in the appraisal of the suitability of other materials, these features must be considered.

The program is planned to continue until enough information is available to satisfactorily specify what properties are necessary and how to measure these

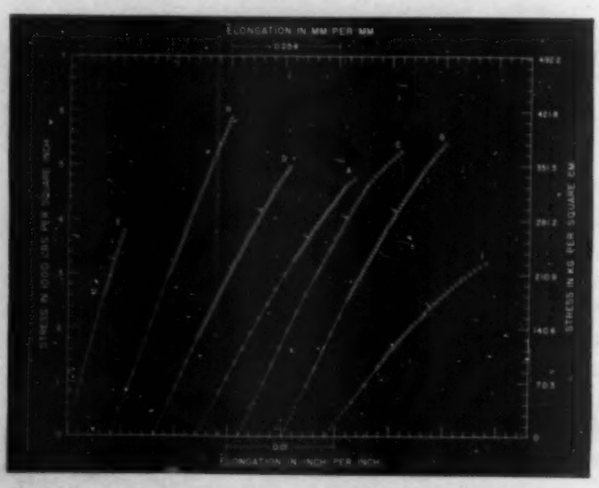
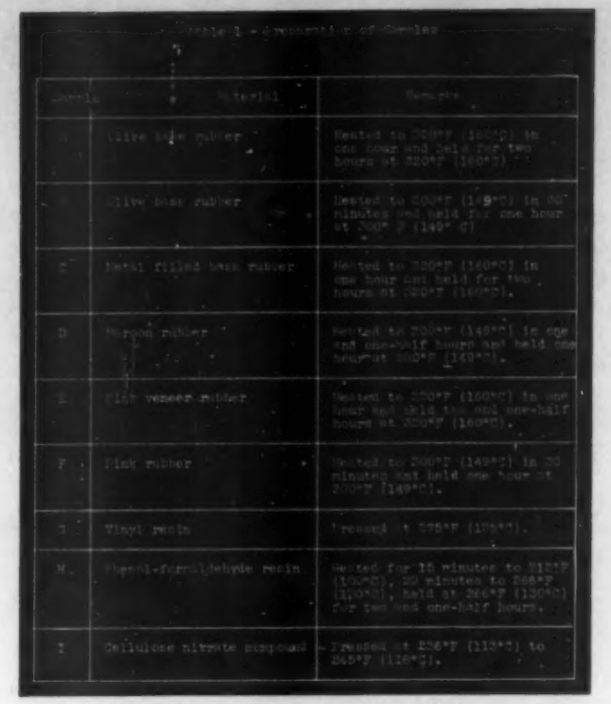


FIG 2

Fig. 1. Standard sizes of test specimens. Fig. 2. Representative stress—strain curves of seven denture materials. E, pink veneer rubber; H, phenol-formaldehyde resin; D, maroon rubber; A, olive base rubber; C, metal-filled base rubber; G, vinyl resin; I, cellulose nitrate compound. Note: The arrow indicates the proportional limit



properties. The dentist can then use this specification as a standard of quality for any denture base material.

II. Materials studied

The materials investigated and reported were obtained through the regular dental trade channels and in this paper are divided into four groups: 1. Rubber; 2. Vinyl resin; 3. Phenol-formaldehyde resin; 4. Cellulose nitrate compounds. Different types of rubber, such as olive, metal-filled, maroon, pink base types, and a pink veneer were included. One typical trade brand product in each of the three other groups was studied. These four types included two thermoplastic materials (vinyl and cellulose) and two thermosetting materials (rubber and phenol-formaldehyde). It was thought that if satisfactory test methods could be developed for these types of materials it would give a satisfactory basis for evaluating any resinous denture base material which might give promise of merit.

III. Preparation of specimens

In preparing specimens for most of the tests, the materials were molded or cured in the form of sheets or plates approximately 250 mm long, 125 mm wide, and 4 mm thick, from which specimens were cut. The processing time and temperature used in the preparation of the specimens are given in Table 1. They are identical in most cases with the manufacturer's recommendations. Some specimens were prepared in metal molds; others were prepared in plaster molds. No significant differences were noted between metal molded specimens and those prepared by using the usual dental laboratory vulcanizing plasters.

Simple symmetrical specimens were used, because any test which would involve the use of an unsymmetrical or odd shaped specimen, which would be subjected to a variety of forces such as shearing, tensile, torsion, and compression would be impossible to analyze and interpret. This is illustrated very strikingly in the case of a denture where the application of a load on one area, for example the molar region, produces stress or strain in all other parts of the irregularly shaped denture.

In the preparation of the specimens, the outside layer of the original plate was removed to simulate the finished surface condition of a denture, but no evidence was obtained to indicate whether the original material had a skin of different properties from the interior or whether the material was homogeneous.

IV. Physical properties

1. Tensile properties

Tensile tests.[2] The tests were made in a 600-pound (270 kg) capacity Amsler hand-driven testing machine. Specimens were milled from plates to the dimensions shown in Figure 1. The load was applied at approximately 10 pounds (4.5 kg) per minute at room temperature. The strain was measured with an averaging extensometer on a 50-mm gage length. Observations were taken to determine the stress-strain curve over the lower range. In most cases the observations extended above the proportional limit as defined in this paper; see Figure 2 for typical curves.

It may be seen from Figure 2 that these curves all have about the same general shape, with the exception of the curve for the cellulose nitrate compound I, which shows a greater deformation for a given load than the other materials. The curves are concave toward the strain axis indicating that the higher the load the greater the deformation produced by a given increment of load.

Proportional limit for these materials is designated as the point where a given increment of stress produces 1.25 times the elongation that was produced by the same increment of stress at lower stresses. The true proportional limit for these materials cannot be obtained, as in metals, even at very low stresses, since

Table 2 - Tensile Properties of Denture Materials

Sample	Material	Proportional Limit		Ultimate Tensile Strength		Set (50 mm Gage)
		kg/cm²	lb/in²	kg/cm²	lb/in²	Percent
A	Olive base rubber	260	3700	555	7900	1.7
B	Olive base rubber	246	3500	534	7600	2.0
C	Metal filled base rubber	281	4000	534	7600	1.3
D	Maroon rubber	295	4200	570	8100	0.7
E	Pink veneer rubber	225	3200	450	6400	0.5
G	Vinyl resin	288	4100	577	8200	3.5
H	Phenol-formaldehyde resin	(1)		443	6300	0.2
I	Cellulose nitrate compound	176	2500	380	5400	26.5

(1) Approaches value for ultimate tensile strength.

here the strain is only approximately proportional to the stress. (See Fig. 2.) The proportional limit as shown in this paper probably has little real significance in its dental application.

Tensile strength is the load per unit area necessary to rupture the specimen, computed on the original cross sectional area of the specimen rather than the area at the instant of breaking. Tensile strength is one of the important properties of materials used in engineering and is useful for comparing different materials.

The tensile strength values for the different materials are shown in Table 2. The material may be divided into three groups on the basis of tensile strength, the highest group including vinyl resin and the rubber compounds, except the pink veneer rubber; an intermediate group including the pink veneer rubber and the phenol-formaldehyde resin; the lowest group including the cellulose nitrate compound.

Set. A 50-mm gage length was marked off on the tensile specimen before applying the stress. After rupture, the pieces were assembled and the increase in distance between the gage marks was measured, and expressed in percentage. The set or plastic elongation represents the flow which occurs when a specimen is stressed to failure and is only a part of the total elongation. In the case of rubber, the elongation at break may be as much as 5 to 8 per cent, whereas the set, as shown in Table 2, ranges from 0.5 to 2.0 per cent. This may explain why such a material is not brittle and seldom fails in service, since it is able to absorb shocks.

2. Impact strength

Impact test. Impact tests were made on a Schopper (Charpy type) impact machine.[1] The specimens (Fig. 1) were broken by placing the small dimension in the direction of the hammer blow. The energy absorbed by the specimen is recorded in Table 3 as the impact strength. It should be remembered that impact tests are comparable only when made under strictly similar conditions but when so carried out they do give a very convenient method of comparing materials of the same class. It is important that denture materials have a satisfactory resistance to breakage from dropping and sudden shocks. Other things being equal, the material having highest impact strength should be the least liable to fracture when dropped or given rough treatment outside of the mouth.

An examination of Table 3 shows that dental rubber has a very wide range of impact strengths depending on the amount of rubber hydrocarbon present. Rubber containing a high percentage of fillers shows lower impact strength than the base type. Therefore, the veneer rubbers with a large percentage of filler are more liable to fracture from sudden blows than are the base type. Phenol-formaldehyde resin H had a low impact strength. It is comparable to the pink rubbers in this respect. The vinyl resin G and the cellulose nitrate compound I have high impact strength, and should be reasonably free from breakage caused by dropping or other impact.

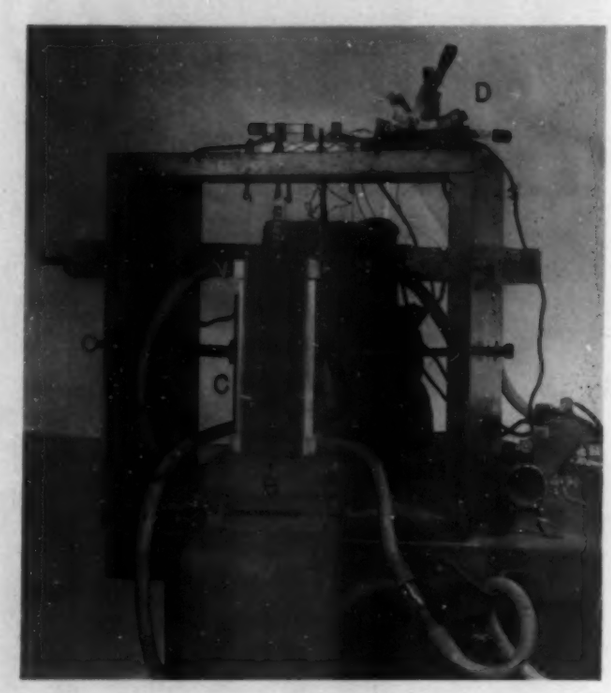
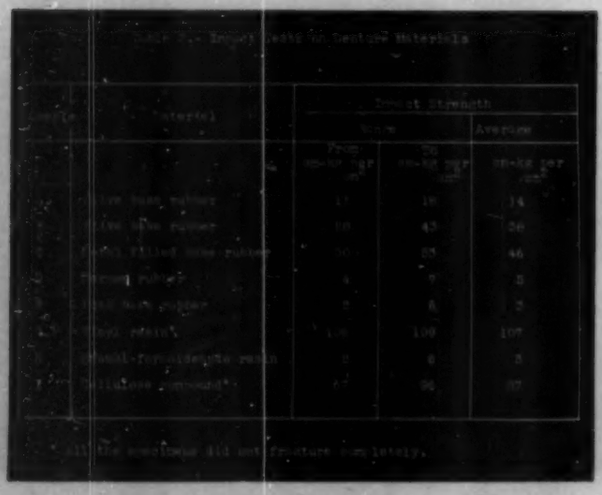


FIG. 3

Apparatus for determining thermal conductivity. A, specimen; B, hot plate; C, cold plate; D, thermocouple outlets from different sections of specimens



3. Flexible fatigue tests

The machines used for these tests were described in the preliminary report.[1] The specimens (Fig. 1) were approximately 10.0 mm wide, 2.5 mm thick, 65 mm long, cut from regularly prepared sheets of the material. Thinner specimens more nearly comparable to the thickness of a denture were used than those employed in the previous investigation; for this reason, lighter dynanometer springs were built so as to obtain greater sensitivity in measuring the fiber stresses.

It is not well understood why materials fail under

repeated stresses much below their maximum strength, but it is a fact and has been demonstrated for many materials. Dentures are subjected to repeated stress in chewing. The magnitude and the number of stress cycles developed in using dentures is not known, but a simple calculation indicates that it is not unreasonable for a denture to be subjected to several million cycles of stress. Determination of the endurance limit, which is the maximum stress at which a sample will withstand an indefinitely large number of flexures, is a very slow procedure. Available information on the endurance limit of the resins is almost nil. Endurance limit tests have been almost wholly confined to metallic materials. Here we are dealing with plastics which are characteristically different.

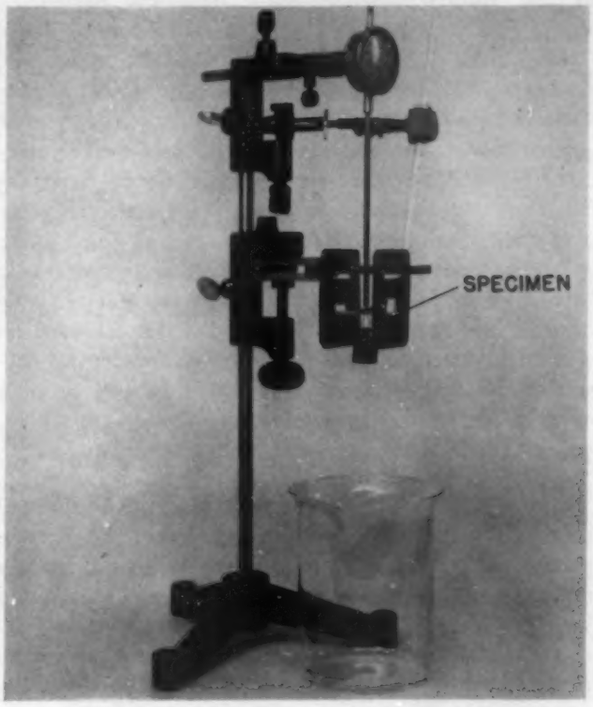
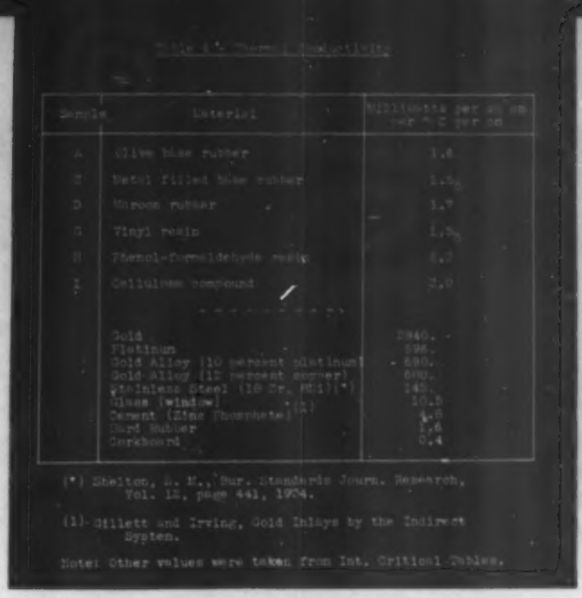


FIG. 4

Apparatus used for measuring the bending of denture materials while being heated

There is evidence to indicate that some of the failures of dentures, in the mouth, are caused by the low endurance limit of the material. It is also felt that other properties, such as internal strain incorporated in the denture during processing and fabrication may be partially responsible for this type of failure.

The determination of the practical endurance limits of all four types of denture materials included in this report, so far as the dental use of these materials is concerned, has not been completed. The results obtained indicate that the phenol-formaldehyde resin H and olive base rubber A have definitely higher endurance limits than vinyl resin G, although the value for the latter material is much improved over the material tested in the previous report.[1] The producers of vinyl resin have indicated that they expect soon to place on the market a material with higher fatigue resistance than that previously supplied.



Sample	Material	Millimeters per sec per cm per °C per cm
A	Olive base rubber	1.6
C	Metal filled base rubber	1.5
D	Maroon rubber	1.7
G	Vinyl resin	1.5
H	Phenol-formaldehyde resin	0.7
I	Cellulose compound	2.0
	Gold	2940.
	Platinum	836.
	Gold Alloy (10 percent platinum)	836.
	Gold Alloy (12 percent copper)	690.
	18-8 Stainless Steel (18 Cr, 8Ni)(*)	240.
	Glass (window)	10.5
	Cement (Zinc Phosphate)	1.8
	Hard Rubber	1.6
	Corkboard	0.4

(*) Shelton, S. M., Bur. Standards Journ. Research, Vol. 12, page 441, 1934.

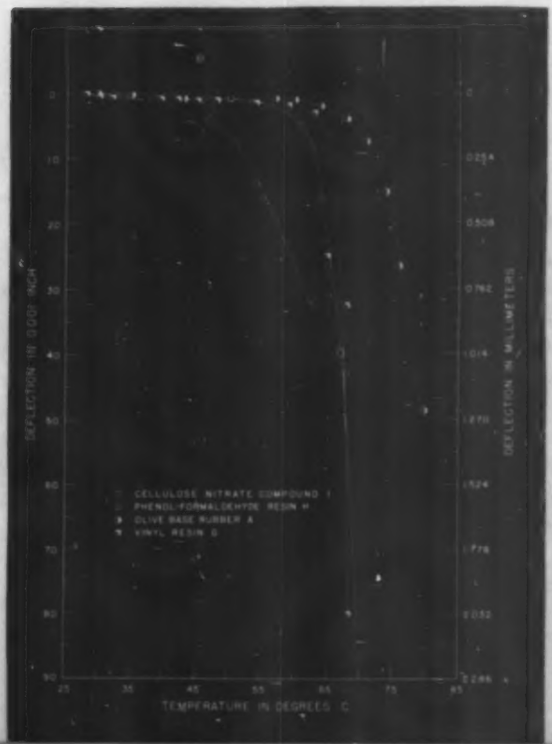
(1) Gillett and Irving, Gold Inlays by the Indirect System.

Note: Other values were taken from Int. Critical Tables.

4. Thermal conductivity

Thermal conductivity measurements were made by M. S. Van Dusen of this Bureau on sheets of denture material approximately 125 mm square in a standard type of hot plate conductivity apparatus (Fig. 3). Three samples of different denture base materials were placed in series on one side of the hot plate and a slab of corkboard of known conductivity was placed on the other side. The sheets under test were separated by soft rubber. Thermocouples were attached to the faces of the samples. When a steady state of heat flow was attained, the rate of flow through all three specimens was the same. Their relative conductivity was calculated from the temperature gradients in the specimens. The test specimens available were too thin

FIG. 5 Showing curves on bending of denture materials



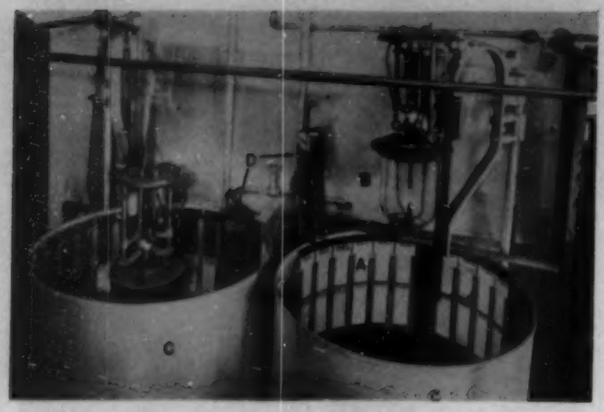


FIG. 6

Light exposure equipment. A, specimen; B, carbon arc; C, revolving drum; D, water spray

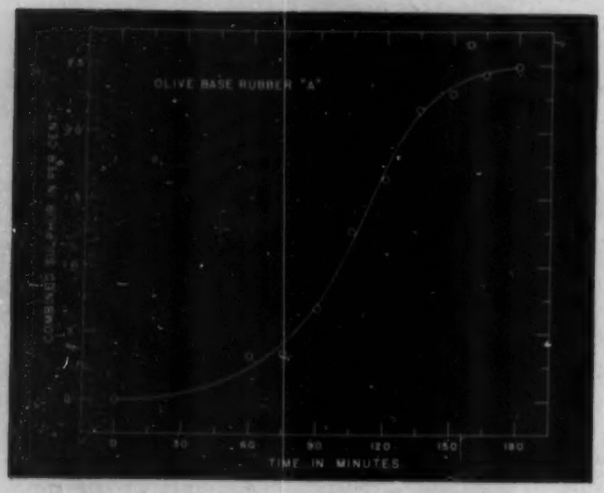


FIG. 7

Rate of combination of sulphur with rubber hydrocarbon during vulcanization

(4 mm approx.) to permit accurate measurements to be made, but any significant differences in them would be easily detected. The absolute values were obtained by calculating the total heat flow through the cork and subtracting it from the heat supplied to the hot plate and are accurate to better than 10 per cent. The results of these tests are given in Table 4 together with the thermal conductivity values for several materials other than plastics.

Many dentists believe that a material having a high heat conductivity is more conducive to tissue health than one having a low conductivity. Examination of the table shows that resinous denture base materials are very poor heat conductors when compared to metals. It is interesting to note that metal-filled base rubber C has, for all practical purposes, the same heat conductivity as other rubbers. This rubber was advertised as having a higher heat conductivity due to the contact of the aluminum particles.

5. Bending properties

The effect of heat on the transverse bending of four denture materials was studied by using a very simple apparatus (Fig. 4). A bar of the material (2.5 by 10 by 65 mm approx.) was placed in two stirrups mounted on flexible self-aligning supports 50 mm apart. A fifty-gram weight was suspended from the center of the span. The mounted specimen was then immersed in a water bath and observations were taken on the bending of the specimen as the bath was heated. The deflection of the specimen was measured on a dial gage as the water bath temperature was raised approximately one and one-half degrees Centigrade (2.7° F) per minute. Test results on four denture materials are shown on Figure 5. This shows the possibility of deforming these denture materials by chewing while in contact with very hot food or by cleaning with hot water. The specimens tested were the same nominal size as the impact specimens. Modified tests were later conducted using the same procedure except that the water bath was held at a constant temperature and the deflection was measured against time. This procedure can be more easily duplicated but further experimentation is needed to establish the most suitable size of specimen and weight to give the desired sensitivity.

By the above procedure no differentiation is made between the elastic and plastic deformation. Experiments are to be made in which the elastic deformation will be determined. It is important to know what portion of the total deformation is plastic, because this is a measure of the permanent set.

6. Cold flow

Preliminary tests on plastic flow using the McBurney[3] Indentation Hardness Tester indicated that the thermoplastic materials had a greater cold flow at mouth temperature than thermosetting materials. This would be expected and shows why some dentures made from thermoplastic materials (such as cellulose nitrate compounds) are liable to warp unless designed with heavy sections.

This type of test gives a much better comparison of the surface hardness of dentures than tests which depend on the application of the load for a stated time. By this method, with a suitable adjustment of the

Table 5.—Chemical Analysis of Unvulcanized Dental Rubbers

Sample	Material	Acetone Extract (1)	Free Sulphur	Total Non-Volatile Residue
		Percent	Percent	Percent
A	Olive base rubber	2.4	28.7	8.8
C	Metal filled base rubber	4.0	24.3	6.4
D	Maroon rubber	4.9	31.4	3.7
E	Pink veneer rubber	1.4	6.6	35.9
F	Pink rubber	2.8	11.9	2.2

(1) Corrected for Free Sulphur

Note: Analysis by method outlined in U. S. Federal Specification [illegible], Feb. 1930.

Table 6.- Sorption of Water by Denture Materials at Room Temperature

Sample	Material	Vulcanized at 160° C (320° F)	Density	Free Sulphur	Increase in Weight per Square Centimeter of Surface Area					
					1 Week	2 Weeks	3 Weeks	7 Weeks	22 Weeks	27 Weeks
Column	1	2	3	4	5	6	7	8	9	10
		Hours	G/Cm³	Percent	Mg.	Mg.	Mg.	Mg.	Mg.	Mg.
A	Olive base rubber	1.5	1.251	4.82	0.09	—	0.13	0.20	—	0.27
A	Olive base rubber	2.0	1.254	2.75	0.09	—	0.16	0.21	—	0.29
A	Olive base rubber	2.5	1.256	2.05	0.11	—	0.18	0.23	—	0.31
A	Olive base rubber	3.0	1.256	1.25	0.10	—	0.16	0.23	—	0.29
A	Olive base rubber	—	1.255	—	0.12	0.13	0.15	—	0.31	—
C	Metal filled base rubber	—	1.183	—	0.09	0.13	0.16	—	0.28	—
E	Pink veneer rubber	1.5	2.463	0.16	0.14	0.20	0.25	—	0.52	—
E	Pink veneer rubber	2.0	2.465	0.11	0.14	0.17	0.21	—	0.44	—
E	Pink veneer rubber	2.5	2.469	0.06	0.11	0.15	0.18	—	0.34	—
E	Pink veneer rubber	3.0	2.471	0.05	0.10	0.14	0.17	—	0.32	—
E	Pink veneer rubber	—	2.481	—	0.14	0.17	0.21	—	0.36	—
F	Pink rubber	—	1.960	—	0.17	0.21	0.25	—	0.52	—
G	Vinyl resin	—	1.355	—	0.13	0.14	0.16	—	0.17	—
H	Phenol-formaldehyde resin	—	1.326	—	0.25	0.29	0.32	—	0.41	—
I	Cellulose nitrate compound	—	1.368	—	1.65*	1.13*	1.57*	—	—	—

*These values for gain in weight are low because of partial solution of the sample during the experiment.

load to the diameter of the ball, the rate of plastic deformation can be observed for a relatively short interval of time and from these observations the flow over a long period of time can be calculated.

7. Color life

The change in color of denture materials may be due to many factors, such as chemical instability, absorption of material, etc. Samples were placed in an apparatus[4] (Fig. 6) used for studying the weathering effects of paints, varnishes, etc. The specimens are exposed to the radiation of a regulated carbon arc. These tests indicated that samples of different denture materials may show marked changes in color when exposed to light for long periods of time. Samples of vinyl (G) and phenol-formaldehyde (H) resins showed a greater change in color than the rubber specimens (A, C, D, E) or the cellulose nitrate compound I, after 36 hours exposure. The ratings were made by visual inspection.

V. Chemical properties

1. Chemical analysis

In an investigation of denture materials in which physical properties are studied it is important that these properties be correlated with the chemical composition of the materials studied. With this in mind a partial chemical analysis of rubber denture materials has been made. Because of the complicated nature of these materials and the necessity of modifying many of the available methods to the particular type of denture under investigation, sufficient time has not been available for making a complete chemical analysis of all the materials studied. The results of a partial analysis of five typical rubbers used for dentures are given in Table 5. The procedures outlined in Federal Specification for Rubber Goods No. ZZ-R-601 were followed.

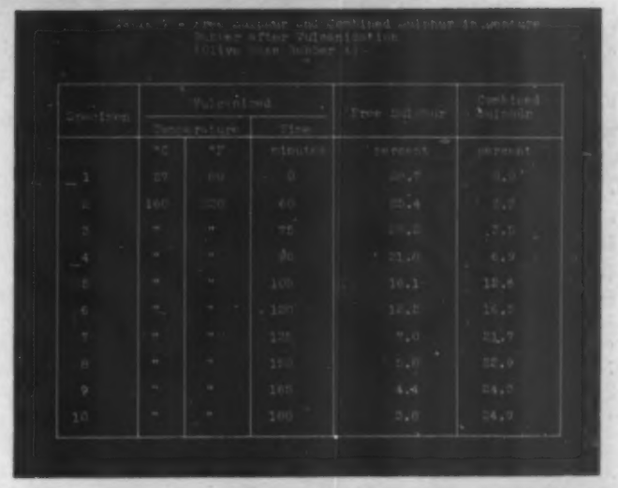


Table 8 - Volume Change of Dental Rubber Vulcanized Two Hours at 170° C (338° F)

Sample	Material	Before Vulcanization		After Vulcanization		Volume Shrinkage
		Specific Volume	Density	Specific Volume	Density	
		cm³/g	g/cm³	cm³/g	g/cm³	Percent
A	Olive base rubber	0.858	1.165	0.799	1.251	6.8
C	Metal filled base rubber	.894	1.119	.855	1.169	4.5
D	Maroon rubber	.584	1.711	.572	1.747	1.5
E	Pink veneer rubber	.426	2.347	.409	2.443	3.8

2. Sorption of water by denture materials

Preliminary experiments have been made on the sorption of water by various denture materials. This work was undertaken for a twofold purpose: to obtain information on the cause of unsanitariness of denture materials and to study known defects of these materials before and after the sorption of water.

For these experiments specimens were prepared of a definite size (2.5 by 10 by 65 mm approx.) and the surface finished with No. 000 (*Continued on page 66*)

Plastics patent information

In a study of the problem of supplying fats and oils in Germany, the oil obtainable from coffee was considered. The surprising feature of the investigation was the observation that percolating does not rob the coffee of its oil, nearly all of which remains in the coffee grounds. With characteristic German thrift, the investigator goes on to suggest that the grounds remaining after extracting the oil are not merely a worthless residue, as might be supposed. When dried and finely pulverized this material has an unusually high apparent density and should make an excellent filler in synthetic resin molding compositions. Molded articles made with this filler have excellent strength and take a good surface finish. Viewing the question of adequate supply from the seller's rather than the user's angle, the further suggestion is made that a potential market for the residue would give added incentive for buying up coffee grounds as a source of oil and so would help to assure a supply. (Herbert Köhle, Chemiker-Zeitung, 1936, p. 409.)

●

A new German molding composition in which expensive textile fibers are replaced by cheap wood cellulose fibers as a reinforcing filler is entirely different from the resin-impregnated paper which is used for making laminated products. Although made from a loosely felted web of wood cellulose fiber, the new material can be molded in many shapes, even for making hollow articles. It can be sawed, planed, drilled, threaded, nailed, stamped, etc. It is sufficiently oilproof for use in contact with transformer oil. Because of its high strength and because it can be worked with tools this molding material opens up fields of use which have hitherto been closed to plastics. The name of the product is "Pete" molding composition (for the maker's initials). It is made by Peter Temming Aktiengesellschaft, Glückstadt, Germany. (K. Bolz, Kunststoffe, 1936, p. 183–185.)

●

A new moistener for office use has its container and cover made of a synthetic resin; so also is a perforated insert plate for holding the rubber sponge in place in case the moistener gets tipped over. As a final touch, the handle of the moistener pad is also a molded product. A novel feature is that the handle can be inverted to stand in the moistener with the sponge rubber pad uppermost; this is convenient for bank tellers to facilitate moistening the fingers when counting bank notes. The maker is Firma E. F. Thomas, Dresdenerstrasse 136, Berlin SO 36, Germany. (Kunststoffe, 1936, p. 192.)

●

Storage battery plates are made with special protection for the areas at which they rest on lugs projecting from the inside wall of the battery box. This protection is provided by attaching to the plates at these points a contact shield made of a synthetic resin composition which is unaffected by the strong acid of the electrolyte. The contact material is a good electrical insulator so that there is no loss of current from the battery. (Swiss Patent 183,299, Société de l'Accumulateur Fulmen, Clichy, France.)

●

Electrical resistances and other molded electrical devices are made by molding a composition of resin and a filler such as powdered glass (the resin being not completely hardened), and etching the surface with a solvent which dissolves away the surface of the resin but leaves the filler particles projecting. The solvent may be a solution of caustic soda in water. This treatment gives the molded article a roughened surface. After washing away the surplus solvent the hardening of the resin by heat is completed. To make electrical resistances from articles treated in this way the roughened surface is filled in with an electrically conducting synthetic resin composition. (Marconi's Wireless Telegraph Co., Ltd., Australian Patent 19,028/1934.)

●

Accurate reproductions of parts of the human or animal body represent only one of many uses for plastics in scientific and educational work. In a new method for making anatomical models or biological specimens a polymerizable liquid vinyl compound is injected into the organ or member of which a model is to be made, and the compound is then polymerized. The resulting solid product faithfully reproduces every detail of shape and contour. The vinyl compound may be vinyl acetate, ethyl methacrylate, or a combination of one of these with a cellulose ester. After hardening the resin the surrounding tissues, bones and the like are disintegrated with acid and alkali and the model is left. (Röhm & Haas Akt.-Ges., 42 Weiterstadterstrasse, Darmstadt, Germany; British Patent 450,350.)

●

Whatever may be the merits of the controversy concerning the presence of nicotine and other impurities in tobacco smoke and the resulting hazards, a British inventor proposes to do something about it. He has devised a method for preparing cellulose acetate or other cellulose derivatives, or cellulose regenerated from viscose, in a tubular form with many longitudinal passages. These filters can be inexpensively manufactured by an extrusion process in the form of fillers for cigarettes, cigars or pipes. Air currents impinging on the material as it is extruded from the very fine longitudinal passages which permit smoke to pass through but retain impurities. The filter fillers may be made with or without an inert powder such as calcium carbonate, of a plasticizer such as tricresyl phosphate. (C. F. Sharman, Windynook, Keynsham, Somerset, England; British Patents 451,682, 451,683 and 451,684.)

●

Paper bobbins, dishes, flower pots and other articles are made by impregnating paper with a synthetic resin and arranging a number of progressively larger coils of the paper around a common center so that a disk is formed when the coils are joined under heat and pressure. For flower pots the blank which is pressed may be cut from nested cones of the treated paper. A bobbin flange is similarly made from a blank cut from nested waste cop tubes. (A. S. Lowry, Textile Paper Tube Co., Ltd., Oakwood Mills, Romiley, Cheshire, England; British Patent 450,356.)

●

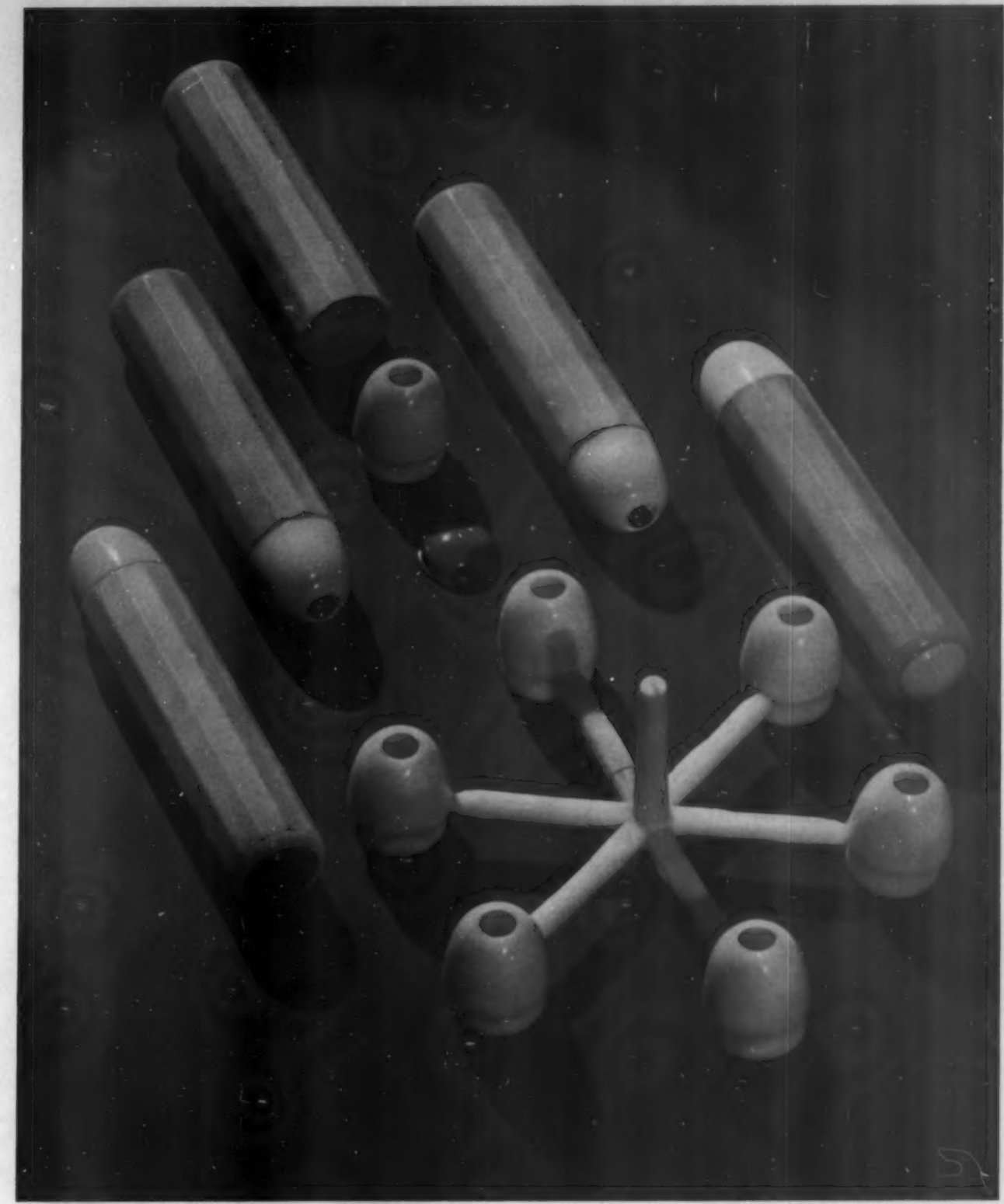
In molding supports for knitting machine parts, especially for needles, guides and sinkers, the elements to be supported are placed in a mold on a die in two rows, one facing the other. A molding composition (cellulose acetate or a synthetic resin together with needed fillers such as wood flour or asbestos) is then packed around the elements, an upper die is clamped on, and the support is molded under heat and pressure. (J. Morton, Tuethur, Carlisle, Cumberland, England; British Patent 450,551.)

●

It has not hitherto been considered feasible to effect good and lasting adhesion between molded resins and glass when the resins required heat for the final operation. On the other hand, there are decorative and other advantages to be gained by providing glassware with molded rims. Such rims can now be successfully attached to glass dishes or the like by tempering the glass, inserting the edges between mold parts, and forcing the resin composition into a space between the mold parts. The molding operation is then completed, and the glass tray or dish comes out with a plastic rim in the desired shape. (L. J. B. Forbes, Pilkington Bros., Ltd., 703 Tower Bldg., Water St., Liverpool; British Patent 451,507.)

●

Hand rails, which have numerous advantages over metal hand rails on buses, trolleys, enclosure railings and the like, are made to retain the mechanical advantages of metal with all the additional points of superiority of a molded rail. This is accomplished by casting a synthetic resin sheath over a metal core. Elastic phenol-formaldehyde resins are used; the thickness of the sheath may be anywhere from about $1/_{32}$ inch up to about a half inch, according to circumstances. The resin is hardened after being applied to the metal core. (W. W. Triggs, Firm of H. Frenkel, Mölkau, Leipzig, Germany; British Patent 451,592.)



Complete Emeloid flashlight assembly injection-molded of TENITE by Athol Comb Co.

TENITE

gives these popular flashlights their gay, contrasting colors, lustrous finish and high resistance to breakage. The complete color range of Tenite, its unexcelled strength, and its adaptability to fast molding make it the ideal plastic for many other industrial and decorative uses. Write for a 52-page illustrated book on Tenite.

TENNESSEE EASTMAN CORPORATION *(Subsidiary of Eastman Kodak Co.),* **KINGSPORT, TENN.**

BACKSTAGE

Good premium number

Humidaire, a cigaret dispenser made by Artcraft Metal and Electrical Products Inc., has a molded base which holds forty cigarets, and a metal dome-like cover to protect them. The cigarets are held upright by molded grooves in the base and there is a clay moistener with a metal cap in the center which assures their freshness at all times. This moistener requires a minimum of attention, just a few drops of cold water once a week, and may be easily removed for filling.

Covers are bright bronze, English bronze and chromium with bases of black or brown in pleasing contrast. Trade names or advertising messages may be printed on in color or gold or a metal seal with monogram or message may be attached to the cover at slight extra cost. Sells at a low price yet there is nothing cheap or cheap-looking about it. Swell premium. Bases molded by Mack Molding Company.

Synthane sales organization

This photograph of the Sales Organization of the Synthane Corporation, manufacturers of laminated sheets, rods and tubes was snapped at a recent convention held at the plant.

General Dyestuff occupies new building

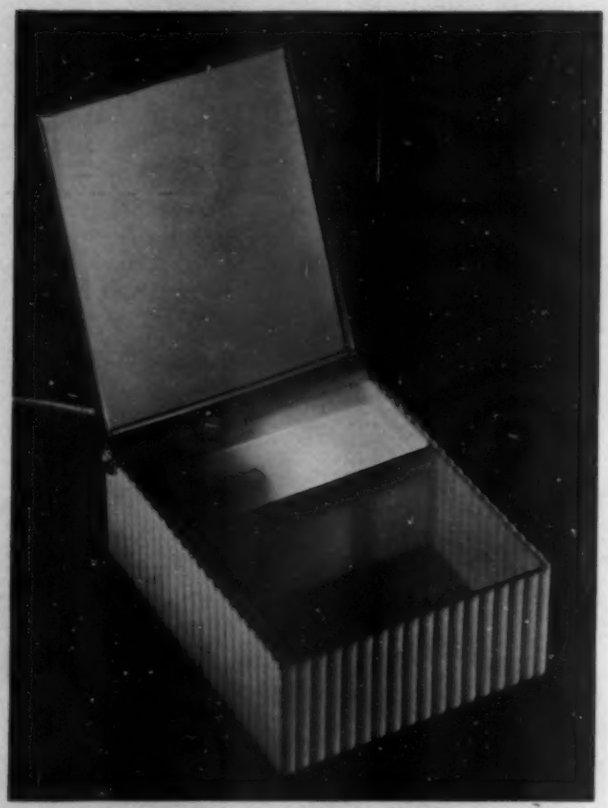
Every departmental activity of the General Dyestuff Corporation is now coordinated under one roof in a newly erected nine-story building located at 435 Hudson Street between Leroy and Morton Streets, New York.

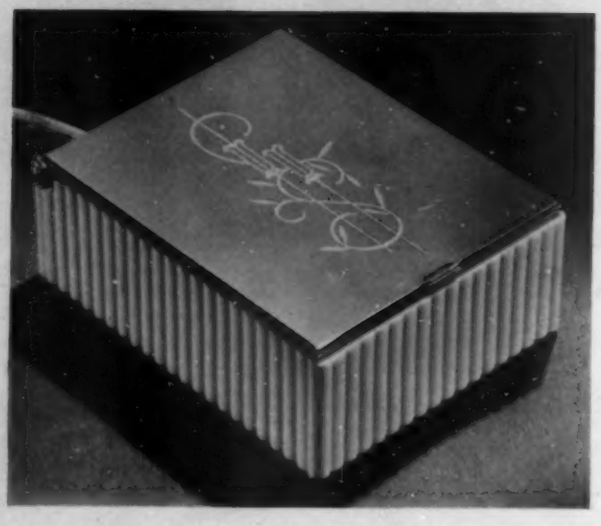
Molded make up box

The Plastic Molding Company has recently produced a molded make up box of ivory Plaskon for Chase Brass and Copper Company. The sides are fluted and the case has a hinged metal cover with a simple abstract design.

Connected to any convenient outlet a switch button controls the lighting of the bulb which is hidden in the rear of the box under a sheet of translucent urea. The illumination through this material is soft and the face is well reflected, for applying the make up, on a mirror which serves as back to the cover of the box.

A separate section in the front provides ample space for storing cosmetics and accessories desired as will be seen in the illustrations of box (opened and closed) which are shown below.





BACKSTAGE

Errata

In compiling the Directory Section of our October issue the name of Frances Cushing Hall was inadvertently omitted from the list of industrial designers. Also the following brand names, products of the Celluloid Corporation, were designated as pyroxylin, while they should have been classified as cellulose acetate: They are Charmour, a finely pleated lampshade material; Clair de Lune, another acetate lampshade material; H-Scale, a synthetic pearl essence; Lindol, a tricresyl phosphate; Protecto, an acetate box toe material; and Safety Samson, a cellulose acetate film base material.

In the directory section of the October issue the laminated material made by Mica Insulator Co., New York City, was unfortunately termed Panelyte, when it should have been, Lamicoid. The address of Thomas Tibbs, industrial designer, which appeared on page 53, November issue, should have been 38 Gramercy Park, N. Y. C.

Probar inlays

We have learned that we were misinformed regarding the source of the metal inlays used in the Du Pont Dresser Set which won Honorable Mention in our Competition. They were made by the Probar Corporation.

American Chemical Society credit

The article "Methacrylate Resins" by H. R. Dittmar, E. I. du Pont de Nemours & Co. Inc. which appeared in our November issue was the same manuscript read at the Plastics Symposium held on September 10 as part of the Pittsburgh meeting of the American Chemical Society and should have been so credited. We were unaware of this fact at the time it was published.

An opportunity for industry

A year old this January, The Design Laboratory under the technical direction of Gilbert Rhode has clearly demonstrated its value in laying the groundwork upon which many industrial designers of the future will build. Students have been given an intensive course in product design for quantity production and with the aid of shop equipment at their disposal, they are enabled to carry their designs through the blueprint stage into models of miniature or actual size. There are three hundred in the present class.

The aim of the school is to teach fundamental principles and to train students to design any sort of useful manufactured object from ash trays to airplanes. Its sponsors, who include educators, architects, museum heads, and industrial designers with established reputations, contend that the school is essential to the development of the new profession of industrial design in this country if its benefits are to be retained.

Get this New Bulletin on

MOLD STEELS

THIS 18 page illustrated bulletin just issued, provides helpful, timely information and data on Mold Steels for Plastics. It tells:

How to select the proper type of steel for specific purposes.

How to get easier hobbing and cavities that take a mirror finish.

How to get molds that will not sink or upset in service.

How to heat treat mold steels for best results.

Working hand in hand with the plastic industry since its inception, the Carpenter Steel Company has designed and developed Electric Furnace Mold Steels especially for the industry. Write today for this new bulletin which gives you the benefit of this experience. Use the coupon below

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SERVING THE SYNTHETIC RESIN, PLASTIC, SOLVENT AND PLASTICIZER INDUSTRIES.

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We solicit your inquiries on all organic products.

NATIONAL ANILINE AND CHEMICAL COMPANY, INC.

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INTERMEDIATES

BACKSTAGE

Design Laboratory has had but two predecessors—one abroad, The Bauhaus in Germany, and a four-year course leading to the B.A. degree set up last year at Carnegie Institute of Technology in Pittsburgh. Courses in certain specialties in design, such as packaging, advertising layout, and even window display, have been given at a number of the more progressive art schools, but no attempt was usually made at an integrated course on these allied subjects.

The school was inaugurated as a WPA project, but having so definitely established itself along sound principles of industrial education, it would seem right and proper that industry itself should take steps at this time to remove the Design Laboratory from the uncertainties of Government control. Industrial design, during the late lamented depression, proved its force as a builder of sales and there is no doubt about its influence on the future. The exigency for trained designers already exists and industry should recognize this situation.

Glyptal cement now being marketed by G. E.

Glyptal cement, a derivative of Glyptal alkyd resins that is flexible, transparent, and exceptionally adhesive, is currently being placed on the market by the General Electric Company's Appliance and Merchandise Department. It will mend or adhere to all common materials except rubber and is both water- and oil-resistant. For domestic use, the new cement is being merchandised through retail household outlets in a handy-sized tube, using an attractive, brightly colored counter display containing twelve of the tubes. For industrial and commercial use, it is offered in quantities varying from pint-sized containers to large drums.

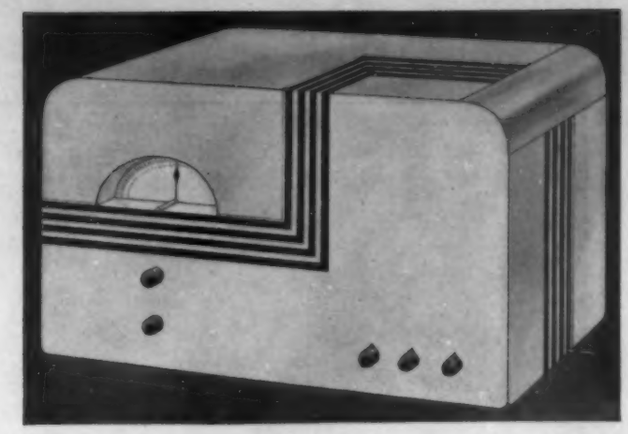
Company meets pay levy

Jersey concern assumes burden
of its employees' security.

Reprinted from The New York Times.

Boonton, N. J., Nov. 9.—The 150 employees of the Boonton Molding Company factory at 326 Myrtle Avenue here will receive all the advantages of the Social Security Act, but it will not cost them a cent. The directors of the company announced today through Herbert L. Dixon, secretary, that the 1 per cent salary donation required by the Federal law would be assumed by the company. The employees, twenty of whom are women, read the following bulletin on the time clock when they arrived for work this morning: "After Jan. 1 the Federal Government requires a 1 per cent cut in your pay, but this reduction will not be made from your salaries but will be paid by the Boonton Molding Company."

The company has maintained in recent years a policy of offering security to its workers beyond that required



DESIGNING *for* 1945

INSUROK *Molded by Richardson*

To give permanence to the artistry of the designer, the skill of the craftsman, INSUROK, the superior plastic developed by Richardson, is daily proving its unequalled versatility. To a thousand products it imparts its own high quality—adds beauty, eye appeal, and salability; longer life and greater practical usefulness. To use INSUROK is assurance that production schedules will be maintained; that the finished product will enhance the prestige of your good name.

RICHARDSON TECHNICAL SERVICE

Call on the Richardson Design, Research and Engineering Laboratories for assistance in the application of plastics to new or contemplated products or in production processes. No obligation, of course.

The RICHARDSON COMPANY

Melrose Park, (Chicago) Ill. Founded 1858 Lockland, (Cincinnati) Ohio
New Brunswick, N. J. Indianapolis, Ind.
Detroit Office: 4-252 G. M. Building, Phone Madison 9386
New York Office: 75 West Street, Phone Whitehall 4-4487

The most modern molding press will be inefficient

UNLESS . . .

A COLTON PREFORMING

machine backs it up!

Colton Preforming Machines are the accepted standard in the plastics industry not only because they speed up the molding cycle but because their unvaring accuracy of performance is a guarantee of better molding at the press. When Colton preform-pellets are used material waste is eliminated, flash is held to the ideal minimum, material handling problems are simplified and costs d
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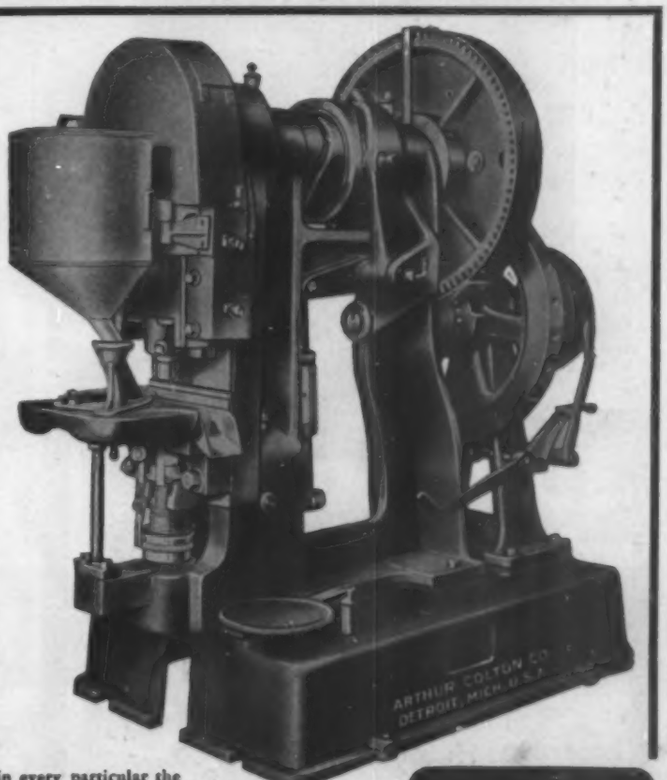
Write us for full details about our complete line of single punch, multiple and rotary preforming machines.



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DETROIT, MICHIGAN

The new improved 5½ tablet machine—in every particular the finest the market has to offer. Solid steel frame insures perfect operation; improved die fastners, improved cam construction, heavier ejecting mechanism, vanadium steel plungers—make high speeds possible without fear of breakdown or lowered quality. Makes tablets up to 3" in dia. having a fill depth up to 2½".

COLTON DETROIT

Phenoform

Colors

A wide range of colors for plastic compounds — especially selected and prepared to meet the most exacting requirements in molding. For particulars apply to

General Dyestuff Corporation

435 Hudson St., New York, N. Y.

BACKSTAGE

by the State compensation laws. Every person who has been employed three months or longer is insured by the company for $1,000. A group disability insurance pays $10 a week for thirteen weeks to any employee disabled.

Tenite sales office

A new sales office of the Tennessee Eastman Corp. has just been opened at 171 Madison Avenue in New York. W. L. Searles is in charge and it is the hope of the company that through a teletype service to Kingsport there will be faster transmission of orders and generally improved service.

Self-lubricating preformer

A new 80-ton heavy duty preforming press incorporating a one-shot system of lubrication was announced recently by the Standard Machinery Co. The abrasiveness and fineness of molding powder can raise havoc with a preforming press which does not get proper lubrication at all essential points, especially bearings, and to overcome any excessive wear on its new press, Standard has provided a central lubricating system in which oil is fed to all parts of the machine needing lubrication by means of copper tubing. Junction fittings are used on branch leads and on each line to each bearing there is a drip plug of the proper size to supply sufficient oil at each point where it is required. Once or twice each day the operator throws a lever which forces oil under pressure through the entire system. The oil system is made by the Bijur Lubricating Corp. The savings are obvious since the operator is not required to go over the machine several times each day with oil can and grease gun—a simple pull of a lever has done away with all that.

1937 British Industries Fair

Latest reports concerning the 1937 British Industries Fair, which will be held in London and Birmingham from February 15 to February 26, show that already, six months before the Fair, last year's figures for exhibiting space have been broken.

The Department of Overseas Trade announce that up to August 10, no fewer than 1,232 United Kingdom firms had applied for 568,930 square feet of exhibiting space in the sections of the fair to be held in London, while 290,000 square feet of space has already been applied for at Castle Bromwich, Birmingham, where the Engineering and Hardware Section of the Fair will be held. For the 1936 Fair 2,458 exhibitors were allotted 823,111 square feet of exhibiting space.

The Fair gives foreign buyers direct contact with the actual manufacturer of an article or the sole selling agent. There is no duplication of exhibits. It is the

MODERN PLASTICS by Stokes

The name STOKES in connection with plastic molding is a guarantee of quality and service. Our 39 years experience in this field enables us to suggest economies without sacrifice of quality. It will pay you to let us quote on your requirements.

Molders Since 1897

Jos. Stokes Rubber Co.
Trenton, N. J.
Canadian Plant, Welland, Ontario

Dependable Chemicals for PLASTICS

FINE HEYDEN CHEMICALS

These products are particularly adapted to the requirements of the Plastics Industry.

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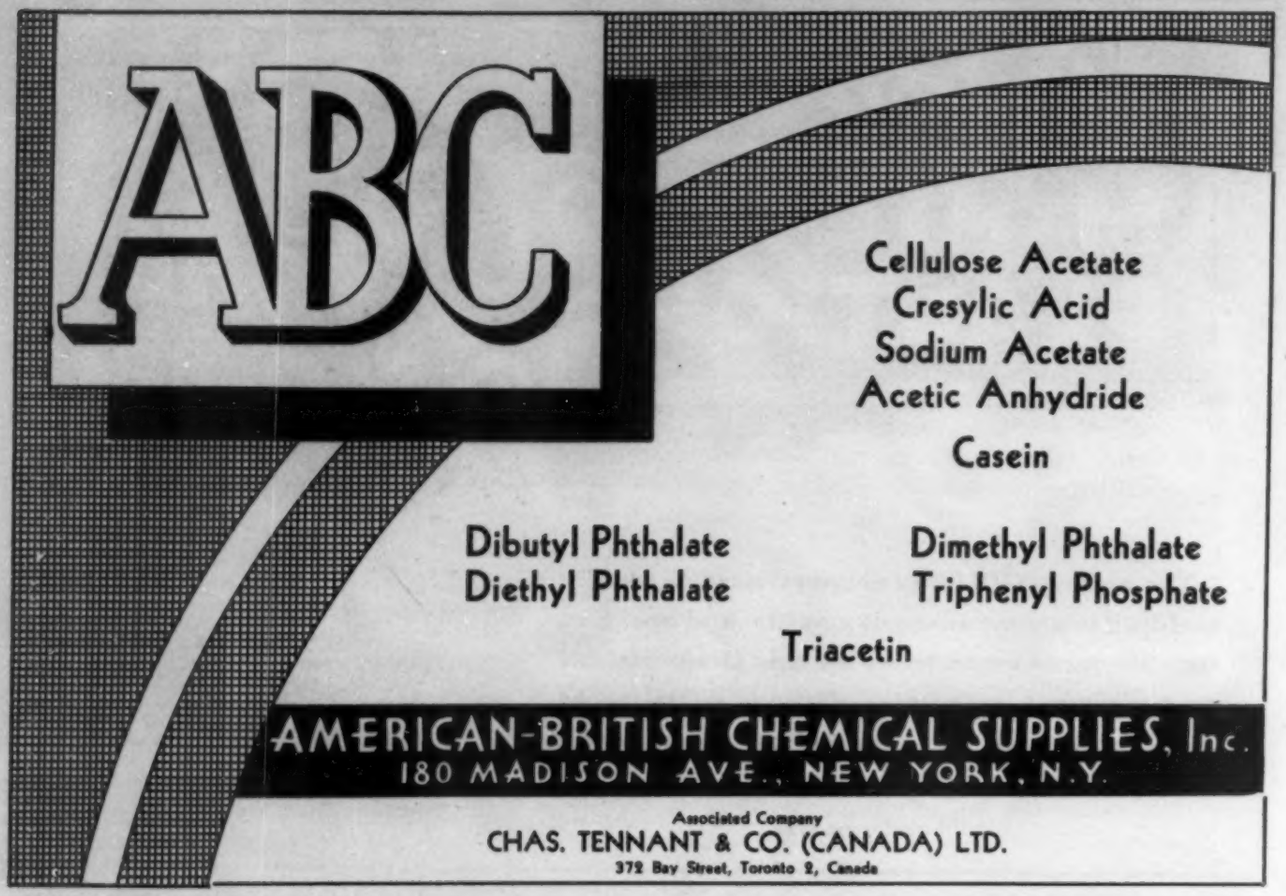
HEYDEN CHEMICAL CORPORATION
50 UNION SQUARE NEW YORK, N.Y.
CHICAGO BRANCH: 180 N. WACKER DRIVE



CLASSIFIED

➡ **HYDRO-PNEUMATIC ACCUMULATOR: For Sale—One Watson-Stillman Accumulator, high and low pressure, complete with air compressor, air receiver, motor driven high pressure horizontal and low pressure vertical pumps; also Hydraulic Presses, 27″ x 46″ and 12″ x 12″ platens. Reply Box 134, Modern Plastics.**

●

➡ **WANTED—PREFORM MACHINES: Will pay cash for idle or surplus preform Presses—also Hydraulic Presses, Pebble Mills, Mixers, Sifterns, etc. Send us your list. Consolidated Products Co. Inc., 13-14 Park Row, New York City.**

●

➡ **FOR SALE: Stokes Model "R" and Rotary "D" Preform Machines; Birmingham 15″ x 36″, 16″ x 42″ Rubber Mill and Calender; Werner & Pfleiderer Mixers, 9, 50, 100 gallon capacities. Stein-Brill Corporation, 183 Varick Street, New York, N. Y.**

●

➡ **WANTED by manufacturer out of this country, a young married man with experience manufacturing Catalin and Galolith buttons and slides, must be reliable, have good references, and be capable of becoming a leader. State age, experience, salary expected in first instance. Reply Box 170, Modern Plastics.**

●

➡ **FOR SALE—MOULDING HAND PRESS—ca. 30 tons, modern German make, sacrifice $250; also some dies. Reply Box 173.**

➡ **Mid-Western Molder has opening for an experienced Sales Representative. Must understand estimating and handle quotations. Opportunity for good connection. State age and experience. Reply Box 171, Modern Plastics.**

●

➡ **CHEMICAL ENGINEER—4 years' experience in development of synthetic resins. Desires position with responsible concern. Now employed. Reply Box 172, Modern Plastics.**

●

➡ **HARDWOOD SAWDUST: We manufacture Dustless Double screened Maple and Birch Sawdust used in the Plastic Industry, in fine, medium and coarse sizes, also softwood. Ask for free samples and prices. National Sawdust Co., Inc., 104 North 6th Street, Brooklyn, N. Y.**

●

➡ **POSITION WANTED—MANUFACTURING EXECUTIVE—Broad general Mfg. experience (Plastics, open and injection molding). Capable business expansion, conscientious hustler, wishes to change for better opportunity. Charge of dept., etc. Mfg. or sales end. Reply Box 174, Modern Plastics.**

●

➡ **PRODUCTION—DEVELOPMENT EXECUTIVE desires connection with plastics concern. Fifteen years' experience laminated and molded plastics. Reply Box 175, Modern Plastics.**

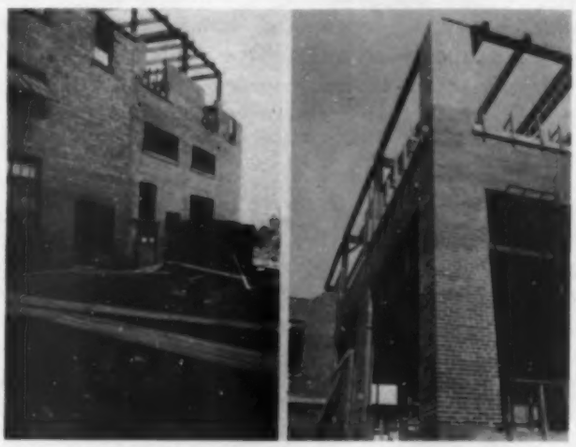
world's largest national trade exhibition and covers the entire range of British manufacturers as well as those from Ireland, the British Dominions and Colonies.

A striking commentary on the development of the Engineering and Hardware Section, which is organized by the Birmingham Chamber of Commerce in close collaboration with the Department of Overseas Trade, is given in the following figures:—The exhibiting area at Castle Bromwich in 1920, the year of the inception of the Birmingham section of the Fair, was 85,000 square feet, whereas this year nearly 290,000 square feet of exhibiting space will be occupied, the frontage of the stands measuring more than eleven miles.

Aside from the Fashion Theater and Earl's Court, the industrial section will include exhibits from practically every plastics material supplier and molder in the British Isles.

Addition to Durez plant

General Plastics, Inc., manufacturers of Durez resins for the paint and varnish industry and Durez molding materials, are completing a new resin processing plant on



their North Tonawanda, N. Y., site. The building is of steel, concrete and brick construction, and is equipped for automatic handling of raw materials and partially processed resins. It was reported to be ready to go into operation late in November.

Erie expands

Erie Resistor Corporation has recently completed a large addition to its main factory containing over 16,000 square feet and three stories in height. This building houses the plastic molding division and general offices of the company. Because it brings together under one roof the molding, finishing and engineering activities that were formerly located in separate buildings, the new arrangement greatly increases operating efficiency, according to Harold C. Sherk, vice-president and general manager. This is the second expansion program undertaken by this company in three years.

PLEXIGLAS

A colorless transparent synthetic resin. Thermoplastic . . . durable . . . strong . . . light in weight . . . water-white. Available in plane and curved sheets.

ACRYLOID
PLEXIGUM
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PLASTICS
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"DISTINGUISHED MOLDERS OF SYNTHETIC PLASTICS"

FOR YOUR EVERY REQUIREMENT

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Lupomatic
Reg. U. S. Pat. Off.

The by-word of the Industry for equipment and processes to produce

THE FINEST FINISH AT THE LOWEST COST

For a finish to bring out the beauty of the article you manufacture investigate LUPOMATIC metal shell hard maple lined tumblers and LUPOMATIC PROCESSES approved by nearly 100% of the Plastic Industry. The metal shell patented feature of LUPOMATIC TUMBLERS makes it possible to replace linings when they wear out and cuts down maintenance costs. LUPOMATIC metal shell hard maple lined tumblers are especially constructed for tumble polishing plastic materials. No steel, bolts or screws come in contact with the work. This prevents scratching of surface and spoilage. Why not get the inside story of reports made by thousands of users of LUPOMATIC EQUIPMENT AND PROCESSES—yours for the asking.

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TUMBLING MACHINE CO., Inc.
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Fairbanks 4-1870—4-1871

Mfgrs. of LUPOMATIC slicing machines, jig saws, carving machines, carving tools, tumbling supplies, etc.

BOOKS OF THE MONTH

Booklets reviewed in these columns will be sent without charge to executives who write for them on their company letterheads. Other books will be sent postpaid at the publishers' advertised prices.

Compounding Ingredients for Rubber

Bill Bros. Publishing Corp.
Price $2.50

For the first time the salient facts regarding the many hundreds of rubber compounding materials used in the American industry have been assembled in book form for the benefit of those persons engaged in the rubber business or who are in any way interested in its compounds. All items are grouped by their trade names alphabetically in functional classifications, showing concisely the available data on composition, source, application, form, properties, specific function and facts regarding the methods of use. The ingredients for dry rubber compounding are treated in Part I; while those for the rapidly growing practice of latex compounding are covered in Part II.

The volume is provided with triple indexes as follows: First, "Materials Index—General," with ingredients listed alphabetically according to their correct trade names; second, "Materials Index—Functional," in which the materials are grouped according to their principal utility in compounding; and third, "Seller's Index," which lists the various sources of supply by company name, showing the respective materials of each in functional order.

The Technology of Plastics

By H. W. Rowell
Published by Plastics Press, Ltd.
London, England—Price 10 Shillings

This is a two hundred page book bound in cloth the object of which, according to its author, is to provide in simple form the essential technical particulars of a comparatively new industry. It is intended for the use of those who wish to know what the plastics now on the market really are and how they are manufactured. It is also designed as a text book for students in Technical Colleges which provide a course of instruction for those engaged in the plastics industry.

The attempt is made to cover broadly the composition, properties and manufacture of the molded and moldable plastics on the market at the present time in England, without touching those which are in the experimental stage or more than mentioning uses for plastics outside the molding industry.

There are twenty-seven chapters which divide the dissemination of information into short readable lessons sufficiently complete in themselves to present a true fundamental picture of each of the commonly known materials and to show how they are most successfully used in industrial applications.

Molding practices and techniques, together with detailed description of equipment and accessories, are clearly indicated and the various types of molds are illustrated and described.

Handbook of Chemistry and Physics 21st Edition

Charles D. Hodgeman, Editor-in-chief
Chemical Rubber Publishing Company. $6

Each revision of this Handbook represents an abstracting service of inestimable importance to the busy technical worker. This single volume of over 2000 pages contains mathematical, chemical and physical data culled from many times that number of pages in the original literature. Particularly noteworthy in this year's book is the new 17-page table devoted to the properties of commercial plastics. The table of physical constants of more than 5500 organic compounds, including many solvents and plasticizers, and the 200 pages of definitions and conversion tables for fundamental quantities should be especially helpful to the plastics engineer and research worker. The 30-page index makes the use of this exhaustive reference work anything but exhausting.

Formica booklet

The Formica Insulation Company has recently issued a twelve-page booklet describing the uses and advantages of their laminated material, Formica. The book contains many illustrations of decorative applications and two pages of color illustrations show the shades in which the material is available.

Ethyl cellulose

Those interested in the use of ethyl cellulose in plastics will want to see a new booklet on this subject issued by Hercules Powder Co., makers of the material. Ethyl cellulose is reported to be a tough, light-proof, thermoplastic, which is alkali proof and acid resistant with unusual flexibility and extensibility as well. Ethyl cellulose can be manufactured and molded without solvents according to this booklet and has excellent electrical properties.

The booklet lists the general properties of the material as well as suggests a number of uses, including the properties they impart to lacquers, varnishes, adhesives, printing inks and finishings of leathers.

Wakefield combines plastic with brass

The F. W. Wakefield Brass Co., recently issued a folder showing its I. E. S. Approved table and floor lamps in which cast plastic is used as the motif of decoration on base and upright. The material has been specially cast to simulate Brazilian onyx and was chosen, according to a letter from the company, "because it is more readily workable and a great deal less liable to breakage." This company is also using molded urea shades in many of its overhead fixtures.

FOR UNFAILING LEAKPROOF PERFORMANCE

On platen presses, moulds, vulcanizing machines and equipment requiring swivel movement of pipe lines, BARCO Swivel Joints provide a definite money-saving by uninterrupted performance.

BARCO Swivel Joints will not leak . . . even under extreme temperature variation. Their construction is such that gaskets will not blow out. Yet they turn freely through 360°.

Catalog 255 will give you complete details. A copy will be sent to you by return mail on request.

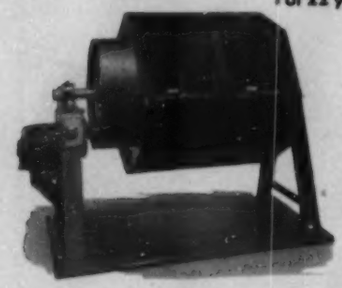
BARCO MANUFACTURING CO.
1813 Winnemac Ave., Chicago, Ill.

BARCO Swivel JOINTS

TO BE SURE OF CONSISTENT
QUALITY PRODUCTION
USE QUALITY EQUIPMENT

CROWN BUILDS QUALITY EQUIPMENT

CROWN designs and builds a complete line of Tumbling Barrels for all types of work, with steel or wood shells—plain or roller bearings—belt or built-in-motor drive.
For 22 years, Crown has given helpful service to the plating and polishing industry. Ourengineers have become experts in solving specialized problems and helping manufacturers back on the road to Quality Production, customer satisfaction and consequent increase in sales. If you have a Tumbling Barrel problem feel free to call upon our engineering staff to help you—or write for special bulletin.



CROWN RHEOSTAT AND SUPPLY CO.
1912 MAYPOLE AVENUE - - CHICAGO, ILLINOIS

Give Yourself a CHRISTMAS PRESENT

Now, while your mind is on it, ask your secretary to mail in your order for MODERN PLASTICS for 1937 (or your continuation subscription starting immediately after your present subscription expires). Only so can you be certain to receive this valuable publication regularly.

The cost? Five dollars a year. But only eight dollars for two years.

That's right. Change that order to a two-year subscription.

MODERN PLASTICS
425 FOURTH AVENUE
NEW YORK CITY

BOOKS OF THE MONTH

Store modernization needs

An analysis of the physical condition and appearance of approximately 8000 small and medium sized stores and service establishments in 23 selected cities of the United States has revealed that over half are in need of modernization in varying degrees, according to "*Store Modernization Needs*," a study made available recently by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. (Price 10 cents).

Processing kettles

W. Maynard McConnell, chief chemical engineer, Patterson Foundry & Machine Co., has written an interesting story on the subject of *Processing Kettles as used for the manufacture of synthetic resins and varnishes*. It completely describes the various types of kettles in common use and indicates the functional advantages of each. The story is available in booklet form with several illustrations.

Industrial uses for Micarta

A booklet illustrating the many industrial applications of Micarta, a plastic material available in many grades and shapes, has recently been announced by the Westinghouse Electric and Manufacturing Co. Listed are the mechanical and electrical properties, the standard forms available such as sheet, rods, tubes, angles, channels, specially molded pieces, etc. Specific applications in electrical manufacturing, radio, aircraft, automobiles, paper mills, steel mills, textile mills, chemical plants, etc., are included.

Tablet machinery catalog

A new catalog on tablet-making machinery has recently been issued by the F. J. Stokes Machine Company. This new folder contains specifications, details of construction and other information relating to all types of machines used in compressing tablets both for the pharmaceutical and industrial fields. Illustrated and described are tablet machines ranging from the smallest hand-operated model to the large single-punch and rotary power-driven machines. Included also are descriptions of drying closets, granulators, mixers, coating and polishing pans, drug mills, etc. Installation views are shown and the Stokes advisory service is described.

Catalog "Q"

Cutters, granulators, and pulverizers for the reduction of all materials are described in detail in Paul O. Abbé Inc.'s new Catalog "Q." The booklet is well illustrated with photos showing closed and open views of rotary cutters, cage mills, and grinders and disc mills. High lights in construction, sizes, enumeration of parts and complete information are given.

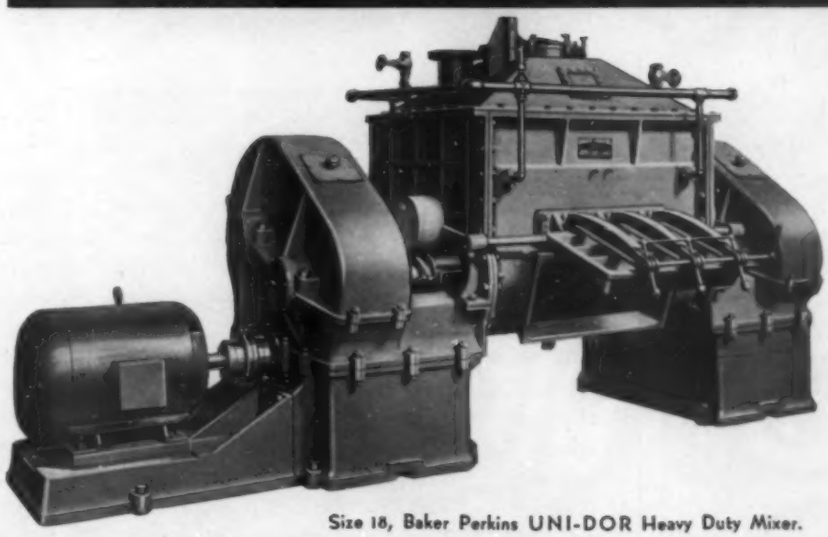
Merry Xmas and a *plastic* New Year

The year 1936 has been a most successful one here at Waterbury and we want to take this opportunity to wish all those who made it possible A MERRY XMAS and a PLASTIC NEW YEAR. Late in the year 1935 we here in Waterbury realized that trends indicated a tremendous increase in the demands for molded plastics, and accordingly planned our budget for 1936 to provide additional equipment and space so as to increase our output capacity 213%. A bold move it may seem at first thought but the soundness of our move has been confirmed time and time again. Now that we are about to begin a new year present conditions demand a similar program. Surely this alone is proof enough that Waterbury is the source of better molded plastics. Everything here at Waterbury is under one roof and one control—Engineers and Designers for your use at no obligation—Molding plant with a complete line of equipment with capacities of 50 to 700 tons.—Tool Room for making all molds—Metal Division for all necessary inserts. All combined to give you fingertip control, constant supervision, and faster service. Be sure—consult Waterbury.

THE WATERBURY BUTTON COMPANY
PLASTIC DIVISION
EST. 1812
WATERBURY, CONN.
NEW YORK CITY . BOSTON . PHILADELPHIA . ROCHESTER
DETROIT . CHICAGO . TORONTO

FOR HEAVY PLASTIC MASSES

THE B-P UNI-DOR MIXER



Size 18, Baker Perkins UNI-DOR Heavy Duty Mixer.

Very Rugged Construction

Gearing Totally Enclosed and running in oil.

Timken Bearings Throughout.

Step-Trough Design, with large quick-opening Discharge Door.

Optional Features: Cored Blades, Special Metal Construction, Jacketed Ends.

In all the years of W & P Universal Mixer development no single unit of equipment has won such instantaneous approval of chemical men as the new Baker Perkins UNI-DOR.

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General Offices and Factory, Saginaw, Michigan
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For eighteen years, leading molders have recognized this firm as the outstanding specialists in the manufacturing of molds for plastic materials, in die-sinking, engraving and hydraulic hobbing.

Our plant is Keller and Gorton equipped for the most economical and speedy production of superior molds.

Place your problems in the hands of this experienced, well recognized and financially responsible concern.

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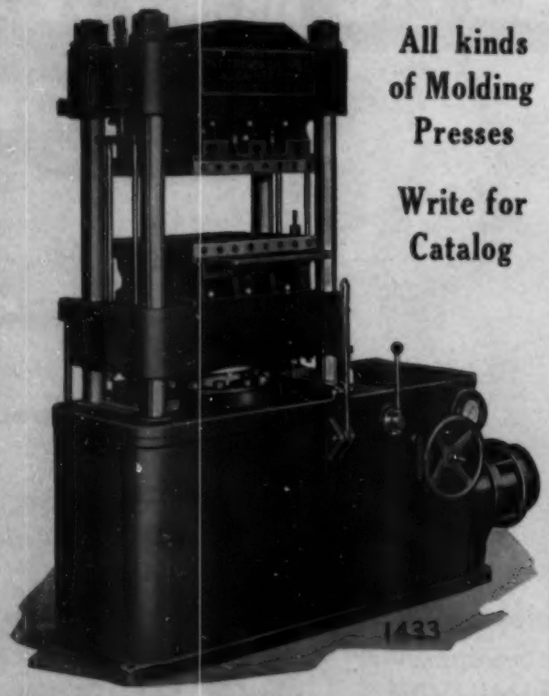
French Hydraulic Machinery



All kinds of Molding Presses

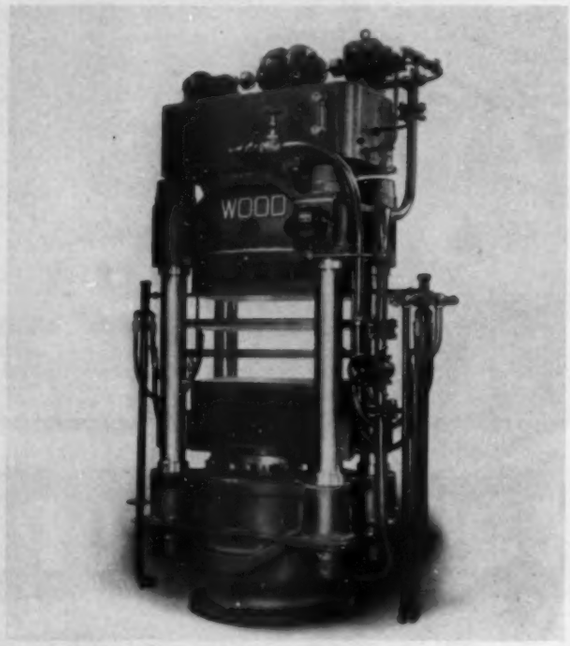
Write for Catalog

Self-Contained Molding Press, Patent Pending

The French Oil Mill Machinery Co.
Piqua, Ohio

HYDROLECTRIC STEAM PLATEN PRESS

Modern hydraulic steam platen and molding presses, operated by individual pumping units have the advantage of permitting a pressure regulation to suit the work on hand, and at the same time holding this pressure during the entire curing period. However, to operate the pressure control on the rotary piston type pump, usually applied to such presses, requires time and considerable effort. Another disadvantage of this type of equipment usually offered, is that during the pressure holding or curing period, especially if of longer duration, the pump and oil pressure fluid will heat up to such an extent that artificial cooling of the oil is necessary.



To overcome these drawbacks, the R. D. Wood Company has lately equipped their HydroLectric Steam Platen and Molding Presses with a device which is reported to have proven very successful in actual press operation, and is incorporated on the hydraulic press illustrated. The pumping system consists of a rotary low pressure gear pump and a rotary piston high pressure pump, both operated by one double ended electric motor.

When starting the press operation by a push-button station, both pumps will discharge their full volume into the press cylinder until the maximum low pressure, at which the automatic low pressure pump by-pass valve has been set, is reached. At this pressure this valve will function and the low pressure pump will discharge its full volume under no pressure back into the pump suction tank, while the high pressure pump will continue raising the press ram and building up to the maximum pressure to which the control has been set.

This pressure control—and holding device, which also performs the function of a hydraulic pressure gauge, is mounted easily accessible to the operator in front of the press. Setting of the control is almost instantaneous

to the desired pressure. When the pressure to which this instrument has been adjusted by turning of the knob has been reached, the electric motor and pumps will be automatically shut down. The pressure on the press ram now will be maintained until this pressure should drop 1 or 2%. At this point the instrument automatically will start up the motor and high pressure pump again for only a few revolutions until this pressure loss is made up. Normally during a curing period of about ten minutes only one intermittent starting up of the motor and pump will take place. It is obvious that with this device the pressure can be held on the press for any length of time without needing any attention by the press operator. Also, the pumps and motor being shut down about 98% of the curing time, no heating of the pressure fluid or pump can take place, and of course very little power is consumed. The press illustrated is of 750 tons capacity, and permits instantaneous pressure regulation between 300 lbs. and 2000 lbs per sq. in. on the steam platen area. This type of press is built by the manufacturer in various sizes and capacities.

ACETATE SHOE FILLERS
by MARY NORTH

In England plastic shoe fillers are having considerable success. They are being used for counter and window display, adding greatly to the appearance and exhibit of the merchandise. Made of Rhodoid (cellulose acetate) by Shelton and Sons, they are sold by them to shoe dealers and department stores. The fillers are not molded but made from sheet stock. A wide range of colors and textures are available including transparent, translucent, and opaque finishes. Individual stores usually have their name or trademark printed in the flat top to increase the value of the display.

In making the fillers the blanks are cut to a template corresponding to the shape of the article to be covered. It is preferable to chamfer the edges which have to be stuck in order to avoid the double thickness of the lap joint. The blanks are softened on a hot plate at the temperature of 110–120° C., bent around the wooden

Courtesy C. B. & Q. Ry.

Keeping Pace with the Zephyr

A NEW example of perfect accuracy by molding, without machining, is this relay-case frame, made by us for block-signal installation on the Burlington Railroad. The high speed of streamline trains requires a special frame-design, molded to very close dimensions to take care of the intricate mechanism contained.

We specialize in custom molding. Complete mold service for special parts or entire products in

BAKELITE, PLASKON, DUREZ, TENITE, BEETLE

Work done in all colors from your blueprints, specifications or molds. Quick delivery of standard parts from stock molds.

Write for Stock Parts Catalog

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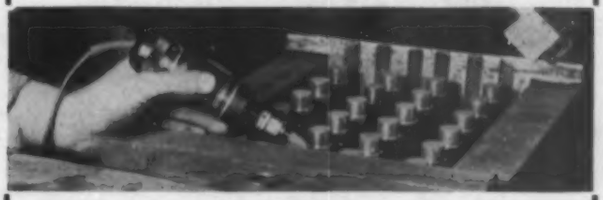
HANDEE TOOL OF 1001 USES

A Great Time and Labor Saver For the Plastics Industry



To touch up pins on molds
To polish dies without leaving residue
To grind notches in a cavity mold on the set-up job
To grind a plunger right on the press in 10 minutes
To grind out holes in mold for brass inserts
—And many other similar jobs.

Fastest and most powerful tool for its type and weight—25,000 r.p.m.—AC or DC, 110 v. Weighs only 12 ounces. De Luxe Model $18.50 postpaid. 6 Accessories Free.

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Does away with drudgery of slow hand polishing. This new product is revolutionizing mold polishing practice. Send for sample

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Irvington, N. J.

Gold Inlaying Press

WITH AUTOMATIC ROLL FEED

Will take Roll Leaf any width to 5". Positive feed from ¼" to 5½". Set ups and adjustments quickly made.

Press is made in three sizes, furnished complete with heating units and 3-way switch control.

Sold with or without roll feed.

This press will speed up production. The stroke gives ample clearance to feed in work.

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We make a complete line of Machines, Tools, Dies, Molds for working Celluloid, Plastics, and Hard Rubber.

MOLDS for INJECTION MOLDING

STANDARD TOOL COMPANY

73-75 WATER ST. LEOMINSTER, MASS.

former and the chamfered edges welded together with an adhesive made of Acetone 800 cc., Ethyl Lactate 200 cc., White Rhodoid, and Scrap 20 grams. The joint is allowed to harden by standing in air for 12–24 hours.

After the hardening of the joints the cones are dried in an ordinary oven at 70–75° C. for three to five days and this is absolutely necessary to produce a perfect joining. The pre-dried cones are next immersed for 1–5 minutes in petroleum jelly heated to 160–170° C., and while still in a soft state rapidly put onto the wooden former which is held with a vice. This former has a metal shank under the arch to hold it securely. The cellulose acetate is pulled first toward the toe to shape it smoothly over the heel, then the sides are pulled down to get a perfect fit over the ankles. The bottom edges are bent under the sole. These operations are done rapidly and must be completed before the material becomes too cool. The point of the filler is then cut to allow the removal of the former.

After being left to drain the shoe fillers are wiped with a cloth or rubbed with sawdust to remove excess oil. Then they can either be washed in gasoline, rinsed in a tank of clean gasoline, and left to dry for ½ to 1 hour; or degreased in cold or tepid water containing soda and soap in solution, rinsed, and then left to thoroughly dry in air for about one hour. Before the finishing operations of trimming and nailing the sole, the fillers are allowed to stand for 24–48 hours, in a damp humid place to let the material regain the resilience lost in the pre-drying stage.

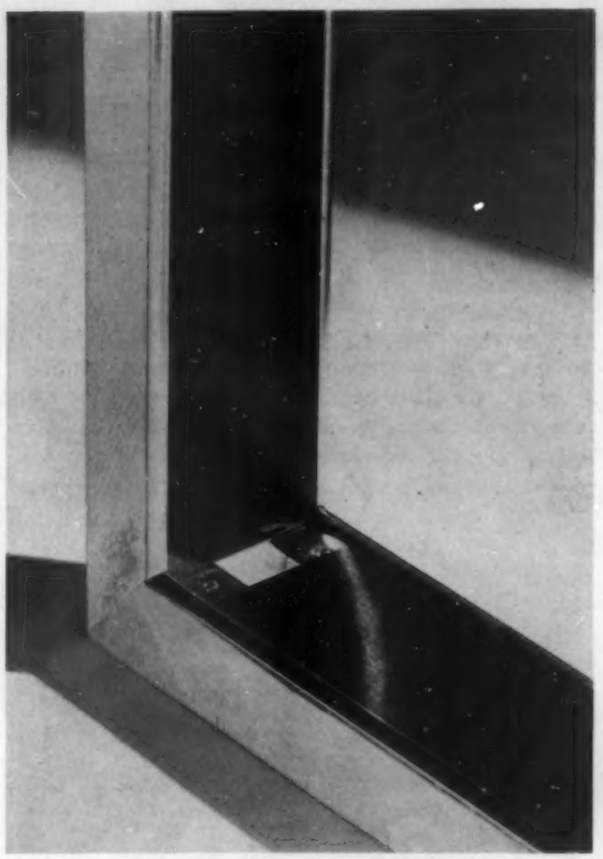
The operations of pulling the sides is done rapidly; by employing one worker and one assistant, it is possible to produce on one wooden former, forty fillers per hour. Any printing is added later to the finished article. These shoe fillers have great display advantage being unbreakable, nonfading, and washable. In the short time they have been on the market their advantages have been proven and their production is now on the increase.

NEW BREAKER STRIP ATTACHMENT

J. M. Connelly, former cabinet engineer with Kelvinator and now plant superintendent of the plastics department of the Detroit Paper Products Co., has worked out a new arrangement for attaching breaker strips to refrigerators. It has been customary to screw them in place, but since there was no method of concealing the screws the sanitary surface of the plastic strip was broken at each screw hole and made the surfaces difficult to keep clean. Furthermore, it was necessary to use metal screws that would be unaffected by moisture else they would rust.

A special molding of stainless steel permits the insertion of breaker strips without screws. The molding is attached to the cabinet by small stainless nails and the breaker strip snaps into place leaving its entire surface free from holes or other detractions from its sleek smooth surface. A section of the device is illustrated here with part of the breaker strip pulled back to show the method by which the molding is attached to the cabinet. The

time saved in installation is a considerable factor because the molding can be tacked in place much more quickly than the breaker strips could be screwed on. There is a further saving of time and expense in that the breaker strips do not have to be drilled as formerly to accommodate screws.



The attaching nails in this new breaker strip attachment are entirely concealed when the strips are in place leaving the entire surface clean and smooth

Sheet laminated is going places in refrigerator manufacturing. Of that there is no doubt. It has proved its value over wood and other materials and within the last two or three years has rapidly corraled this market. Its insulating value is necessary to prevent conductance from the outer to the inner steel chamber with consequent condensation and frost formation. The material is strong enough to be of some actual structural value. It is moisture resistant so that no swelling occurs. The finish is permanent and soap solutions used commonly to keep refrigerators clean have no effect upon it. It is odorless in itself and will not absorb food or other odors with which it comes in contact in use. All these factors combine to make laminated plastics ideal for the refrigerator use.

Plastic breaker strips are accounting for a considerable tonnage of material. They are almost universally used in the better known refrigerators and with this market increasing as rapidly as it has been in the past two years,

THIS TOOL
DOES IT
better and at less expense

cleans
PREFORMERS
PRESSES
MOLDS
MOTORS
and all
INTRICATE
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It's Portable—Plugs in any Light Socket

In the Plastic Industry the Clements Cadillac Portable Blower and Suction Cleaner is recognized as the handiest, most economical and thorough method of cleaning motors, specialized machinery, stock bins, line shafting, etc. Prove it to your own satisfaction by sending for our 10-day free trial offer.

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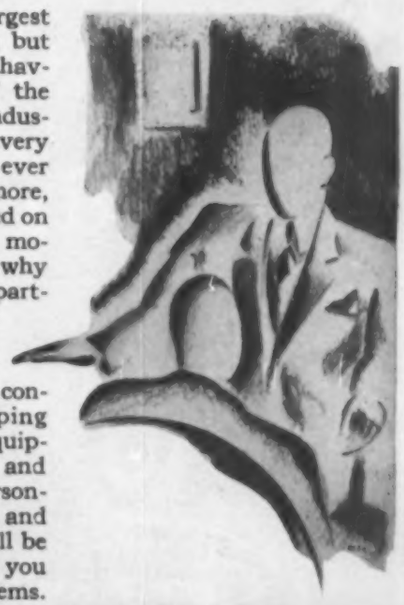
We are not the largest molding concern but we are proud of having been one of the pioneers in this industry; proud of every job we have ever done. What's more, we have not rested on our laurels for a moment. That is why we maintain departments of engineering, design, and chemical research. We are constantly developing new ideas. Our equipment is modern and efficient; our personnel, experienced and capable. We shall be very glad to help you solve your problems.



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In permanently mounted, as shown above, in either single point or two-point styles or in self-contained, portable types . . . each specially designed for molding work. Note ease of reading and simplicity of installation. Send for full details about these time-saving, money-saving, moderately priced instruments.

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CHEMICALS OF QUALITY
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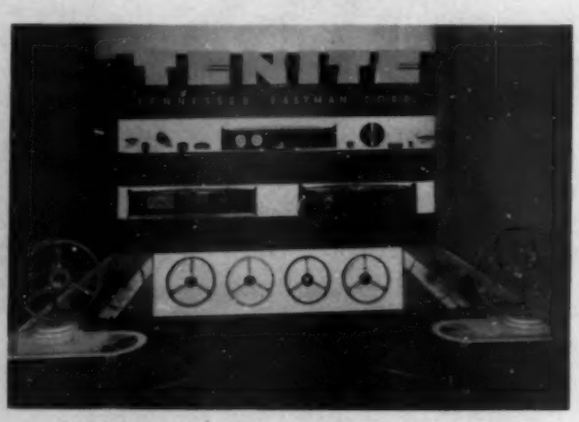
their field will become greatly extended. With this new and improved method of attaching them, other manufacturers of refrigerators will undoubtedly become interested in their use. The catch is, that for the present at least, their availability will be limited to users of Duraloy breaker strips because Mr. Connolly has applied for a patent on the method of attachment.

AUTOMOBILES OF 1937

(*Continued from page 21*) the usual appointments, including escutcheons and instrument knobs. The radiator ornament is red cast resin as it was last year except in a new more delicate design. The Hudson Brougham has a hand-plate of plastics on the rear doors.

The new Willys has modern long white plastic rods, or bars, to open large glove compartments on either side of the instrument panel as well as white plastic knobs on the instrument panel and doors. The standard coupe has a white acetate wheel and horn button.

The stately Dusenberg, of which there was but one example at the show, and that one sold, has three acetate knobs in the rear compartment but we couldn't get near enough to learn what they were for.



Booth at the Show by the Tennessee Eastman Corp. displaying Tenite accessories for automobile interiors

Chrysler, De Soto, Plymouth and Dodge have the usual applications in knobs, ash receivers, escutcheons, and gear shift controls but nothing particularly new so far as plastics are concerned.

The Jaguar model of the Standard Swallow Co., an English car, has a molded phenolic instrument panel, control knobs and horn button as have the Lagonda and the Acedes, two other British cars which were on display.

Packard and Pierce still prefer metal to plastics for similar appointments, keeping most of the plastics used in these cars under the hoods. The plastics industry was represented at the Show by the Tennessee Eastman Corporation who exhibited Tenite accessories in its booth on the third floor. Steering wheels from many cars, together with automotive hardware of every description and accessories were prominently displayed.

Trailers occupied a floor of their own this year and the steady flow of enthusiasts inspecting them indicates the interest they create. Trailer manufacturers like plastics but with few exceptions find them out of reach for extensive use. Some of the better trailers exhibited however, have laminated materials in their galleys and plastics are used quite generally for handles and knobs on stoves. Although not standard equipment, urea dishes appeared frequently in the dining sections to indicate their suitability to the vagabond life.

Meeting the special needs of serving meals in automobile trailers is a new set of dinnerware, created by Simon Slobodkin for Cavitt-Shaw. Consisting of twenty-three pieces, "Trailer" dinnerware provides every necessary table dish for comfortable meals aboard a home-on-wheels.

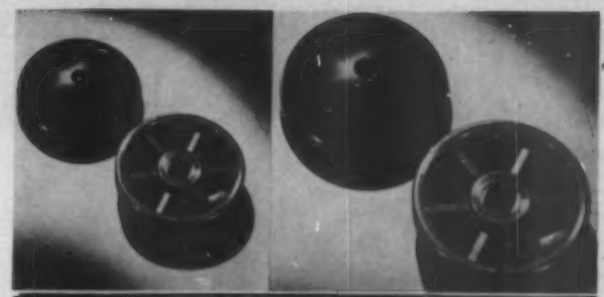
Permanent American ceramic colors, applied by the over-glaze method, provide vivid and lasting decorations that are unaffected by daily use, frequent washing and contact with acid foods. These colors are manufactured by the R. & H. Chemicals Department of the du Pont Company.

Speaking generally, the automobile show was intensely interesting. It demonstrates the ability of a tremendous industry to swing into momentum with an improved product so appealing that sales resistance is reduced to its lowest point. Design has undoubtedly advanced more rapidly in the automotive field than in any other and its influence is more profoundly felt. Not outward and physical design alone, but internal and functional design for improved performance which is rapidly translated into volume sales. If I were in a critical mood, I would suggest that there might be an advantage in a little more individuality in the appearance of cars and in a serious study by automotive engineers of the potential economies available through greater understanding and use of plastic materials.

DECORATING WITH LIQUID METAL

(*Continued from page 20*) jigsaw the entire design through the plastic thickness, and fill in the space with molten metal. A group of black buttons, one and a half inches in diameter, have the metal inlaid in a jigsawed circular design, starting in the center, and winding around to the edges, in a smartly severe effect. The two latter methods of inlay are absolutely unremovable.

The possibilities for this process of metal inlay are limitless in the field of design. The pattern may be either carried out with the metal itself, or the metal may be used to outline figures in the plastic in an unusual silhouette arrangement. And, this type of inlay need not be necessarily confined to the fabrication of accessories. Countless different and practical designs suggest themselves for smoking accessories, interior plastic applications, furniture decorations, such as table tops, lamps, and handles, as well as desk and dresser sets. Individual and unique, this form of metal inlay is a development well worth watching.



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Shown above are two different sizes of one of our outstandingly successful handle moldings, which are available as "stock items" without mold costs. We have a number of others in the same category.

TRADE DM MARK DIEMOLDING Corporation
CANASTOTA NEW YORK

SINCE 1918
PLASTIC MOLDS
HAND
AUTOMATIC
SEMI-AUTOMATIC
and EXTRUSION
to the LATEST METHODS

Designers and builders of all types of PLASTIC MOLDS.

Serving most of the leading molders in the country!

Our 1500-ton hydraulic Hobbing Press adds many advantages in obtaining lower mold costs.

Estimates on request.

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TO OUR GOOD FRIENDS

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we convey our appreciation of their patronage and extend our sincere wish for

A

MERRY CHRISTMAS

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HAPPY NEW YEAR

CLAREMONT WASTE MFG. CO.

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Complete Line of

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Cavagnaro-Loomis Vacuum Mixer

(Patented)

RESIN FILM AS A PLYWOOD ADHESIVE

(*Continued from page 19*) tion of phenol-formaldehyde resins in plywood, was a long since accomplished fact. The simple truth, however, is that only within the past five years can it be claimed that a phenol-formaldehyde resin has been applied to this problem with adequate success and carried out on a sufficiently wide commercial basis over a long enough period of time to justify the statement that its bonding of veneer into plywood has been an outstanding industrial success.

One might easily draw the conclusion from the literature, that once the process of utilizing these reactive resins for this purpose has been recognized, the development of a suitable type of resin in a suitable form, is a simple matter. The fact that it took nearly 20 years before this really successful process was developed, speaks for itself. The problem presented many difficulties. All problems of adhesion are peculiar and specific in their character. Wood is a very special type of product in itself, and the conditions under which it must be bonded are, in a considerable measure, fixed by the practice of the industry, and by certain definite economic conditions. These conditions, technical and economical, were finally met by one type of phenol-formaldehyde film, from which a reactive phenol-formaldehyde condensate, carried on a cellulose web base, was developed which met all the practical conditions of the problem and millions of square feet of this resin film veneer and plywood are being made each month, with less difficulty of variation in quality than with the water soluble glues so long used.

Properties of plywood bonded with Tego resin film

The use of this sheeted resin imparts to plywood a number of properties that make it, in a sense, a different material. Naturally, the greater the number of plies and the thinner the veneers, the more a panel takes on the properties of the resin. Some of its general advantages are:

1. The joint between two sheets of veneer is stronger than the wood itself and insoluble in water, as well as chemically inert and resistant to molds, fungi and bacteria.
2. The film process is simple and quick, requiring less factory labor than wet glue, a much shorter time under pressure, and a product ready for delivery in a matter of hours, rather than days (as in wet glue).
3. Extremely thin and porous veneer, too thin for mechanical spreading or hand brushing, is successfully glued with resin film.
4. Delicate and light colored veneer can be glued without staining or other discoloration.
5. Dry gluing in a hot press "irons" out the surface of the wood while wet glue "raises" the wood grain.
6. While many plywood adhesives will deteriorate rapidly at 200–250 deg. F., these resin

film bonded products hold their strength up to the point where the wood begins to char.

7. Plywood made with this resin film can be steamed or soaked to permit a wide range of curves and bends, to be "set" by the application of heat, but with only enough pressure to make the curve or bend permanent.

Widening the plywood market

The critical factor in plywood manufacture and use has always been the "glue line"; whether or not it was: 1. Uniformly spread and light—2. Simple factor processing—3. Reasonable in cost—4. Water resistant, and to what extent.

The hazard of water exposure has been up to the present time, the most serious market handicap, and has been responsible for most of the public aversion to plywood products. A beautiful piece of furniture, after twenty years of satisfactory service, might be stored for a week in a damp room and be irreparably damaged. Rain through an open window, or a leaky roof, might ruin a plywood paneled room at any time.

The absolute water resistance of the resin-film bond is a distinctive characteristic and its importance has been widely recognized and appreciated. It has already opened up many new sales outlets where water and weather exposure are a definite challenge.

House building: The vast majority of houses have been, and for some years to come are likely to be of wood. Plywood is sheet wood of large but convenient area, easy to apply, free from shrink and swell, non-splittable, and with a minimum of joints. In spite of only partial waterproofness, the use of casein plywood in house construction was increasing rapidly. With the availability of this film-glued waterproof plywood, synthetic resin is becoming a vital part of house construction. There is little doubt that the prefabricated, factory-assembled, field-erected house is here to stay. Extensive research by the most competent authorities among a wide variety of building materials has proven that plywood is the most practical and available material for low priced housing. It comes in large sheets, is easily worked, may be attractively finished and is moderately priced. Plywood glued to studding or joists results in "hollow-beam" construction, permitting the use of smaller joists and studs than otherwise allowable. Plywood is light to handle for erection crews and can be worked with ordinary carpenter's tools. Above all, when resin bonded with this film glue, it is absolutely dependable in the face of water and exposure.

The Federal Housing Administration is advocating complete houses to cost $3000 to supply an income bracket not heretofore eligible as home owners. Gunnison Magic Homes, Inc., has demonstrated that a 4-room, 24 feet by 32 feet completely equipped and insulated house can be made to sell at $2500 to $2700. The writer would not dare to predict how much plywood such a house-building program can use, nor what a marked degree of social comfort and stability will

CHECK YOUR PRODUCT

against this FADA radio

1. Does it have a housing of such outstanding beauty of line and detail? Is its surface so clean and eye-attracting?
2. Is your housing as simple (two parts in all) yet as completely protective to every mechanical part? Is it as easily assembled? Are the parts interchangeable?

The style and mechanical perfection that is carrying this Fada Model to new sales heights is due, in large measure, to the molding ability and ingenuity of the Associated Attleboro engineers who, in cooperation with Fada executives, planned this outstanding housing. Your product—whatever it may be, can profit from moldings, fittings and housings of equal perfection.

Your inquiry is invited.

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ATTLEBORO. MASSACHUSETTS

DUPLICATE DIES
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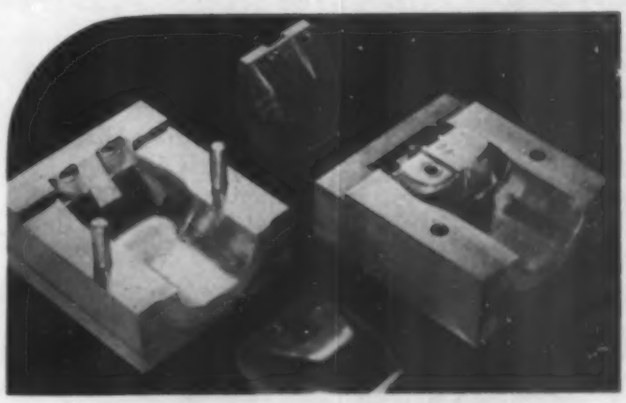

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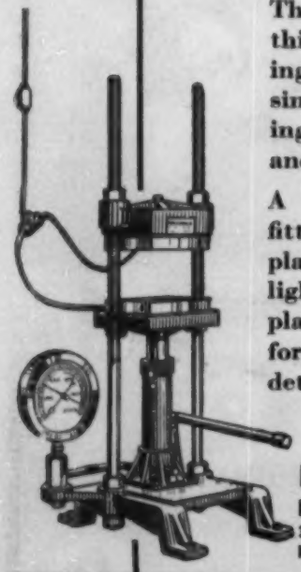

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Air conditioning equipment: This advance in human comfort is predicted by many to be the next major industrial development. Waterproof plywood affords a light and moderate priced material for housing cabinets, ducts and the like.

Other applications: There are many other opportunities for waterproof plywood, some of them already partly filled by the water resistant types, but ready to be more adequately met by resin-bonded panels. Among them are concrete forms, seating of all kinds, sport equipment, outdoor furniture, various construction projects other than houses, bus and truck bodies, cabs, and the like.

Synthetic resins have already shown their unlimited possibilities and their fundamental usefulness in a great number of forms and methods of application, over a long period of time. In the commercial establishment of resin-glue film, it is noteworthy that there has been no substantial replacement of an older material (wood), but rather a cumulative effect that has resulted in progress all around. This type of plywood, by its nature, combines and displays the desirable properties of both wood and synthetic resin.

A PROGRESS REPORT ON DENTURE BASE MATERIALS

(*Continued from page 43*) emery paper. The procedure adopted was as follows: Specimens were dipped into alcohol, then into ether to remove surface water and any oil film which may have been present, weighed immediately and immersed in water in a closed container at room temperature.

The specimens were removed from time to time, the surface water again removed by dipping in alcohol and ether, and weighed. Any gain in weight was attributed to sorption of water.

The results of these experiments for a period covering 27 weeks are given in Table 6.

These results should not be interpreted to mean that those materials which show high increases in weight will necessarily produce unsanitary dentures. Experiments will be made which will attempt to correlate

known defects with the sorption of water. It is to be expected that materials which show a high sorption will also show a marked change in physical properties under ordinary oral conditions.

The free sulfur content of two types of rubber vulcanized for various lengths of time (1.5 to 3.0 hours at 160° C (320° F)) under identical conditions was determined. Results of sorption measurements made on these samples indicated that the amount of water taken up was not materially increased or decreased by the degree of vulcanization as determined by the free sulfur content.

3. Rate of combination of rubber with sulfur

The combination of sulfur with rubber hydrocarbon can be used as a measure of the degree of vulcanization. The rate of combination of sulfur with rubber hydrocarbon in a sample of olive base rubber A during vulcanization is shown in Table 7. The sample was vulcanized in a thin sheet under pressure and specimens removed at 15 minute intervals between 60 and 180 minutes. The amount of free sulfur left in the specimen was determined by extraction with acetone.[5] The rate of combination of sulfur can be seen in Figure 7. The free sulfur was decreased from 25.4 per cent to 12.2 per cent in the first hour after reaching 160° C. (320° F). It gradually decreased after this time indicating that the main part of the vulcanization is over in approximately one hour after the above temperature was reached.

4. Volume change on vulcanization

Some preliminary determinations on the volume change incident to vulcanization were made by vulcanizing a sheet of uncured rubber as received from the manufacturer between aluminum plates in a dental vulcanizer for two hours at 170° C (338° F). The results indicate that all samples show a shrinkage. The high filler rubbers shrank less than the olive base. This is in accord with the results reported by Snow,[6] which were obtained by an entirely different method. The samples in this experiment were weighed and their volume determined both before and after vulcanization. The results of these tests are given in Table 8. These values are to be considered as approximate until more extensive experiments are carried out.

VI. Summary

1. This report is a continuation of a previous report,[1] on denture base materials and deals with tests of the following representative materials: Vinyl resin, phenol-formaldehyde resin, a cellulose nitrate compound, and four types of dental rubber, olive, maroon, pink-veneer, and metal-filled.

2. The cellulose nitrate compound was characterized by a lower tensile strength, lower proportional limit, larger set, and greater deflection when heated under load, and hence would probably be subject to greater distortion in the mouth than the other materials.

3. In the flexural fatigue tests thermosetting mate-

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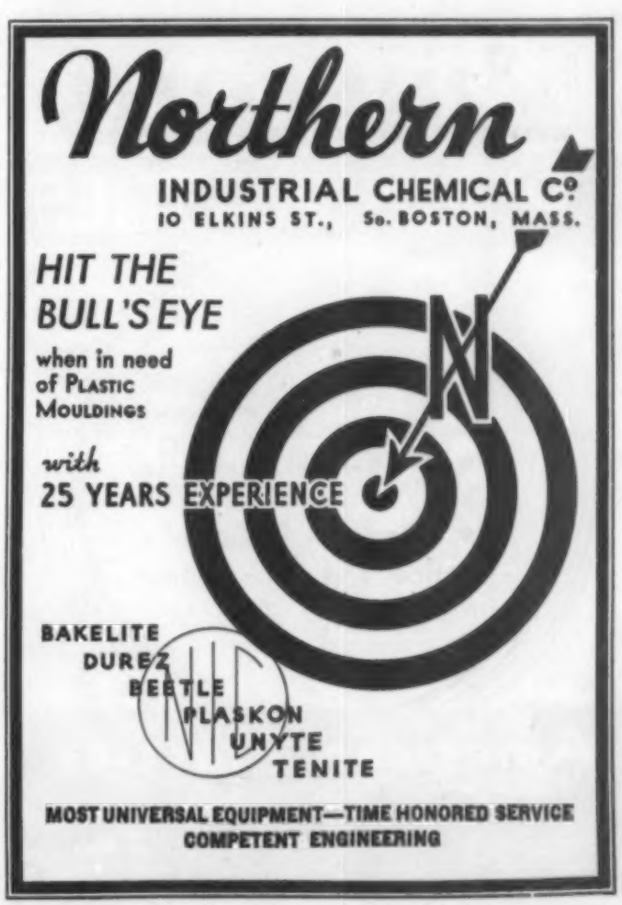

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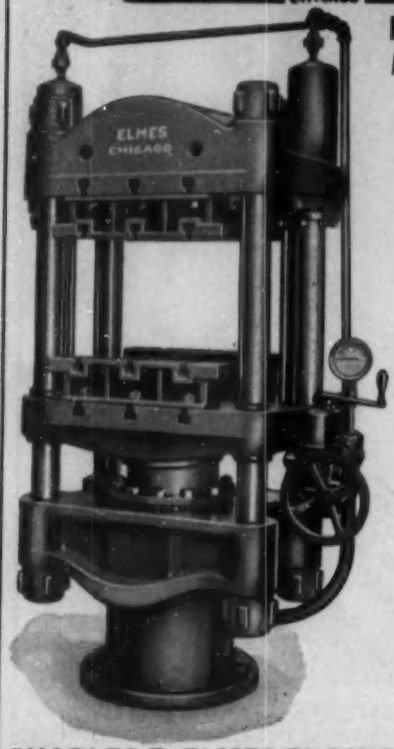

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rials had higher strength than those obtained for the thermoplastic materials, that is, they would withstand higher stresses for a given number of cycles.

4. The thermal conductivity of these resins was very low in comparison to metals.

5. The softening ranges were determined by means of a transverse bend test. Cellulose nitrate compound I softened at appreciably lower temperatures than the three other types.

6. All materials tested increased in weight on immersion in water, and continued to increase in weight throughout the test which extended over several weeks. This increase for the cellulose nitrate compound I was very high in comparison with the other types studied.

7. The amount of free sulfur left in specimens of a rubber vulcanized for different lengths of time was determined. The decrease in the amount of free sulfur left in a specimen of olive base rubber indicated that the major part of vulcanization had occurred in one hour after a temperature 160° C (320° F) had been reached.

8. All the rubbers tested showed volume shrinkage during vulcanization. The shrinkage was greater for the olive base rubber than for the rubbers which contained more fillers.

9. This progress report is presented in the hope that it may stimulate interest of manufacturers, schools, and practitioners in the physical properties of denture base materials.

(1) Barber, Ronald, Preliminary Tests of Some of the Newer Denture Materials, Journal Am. Dental Assoc., vol. XXI, page 1969, Nov. 1934.
(2) Refer to reference in footnote (1) for detailed description of tests.
(3) McBurney, J. W., Indentation of Asphalt Tile, Am. Soc. Testing Materials, Vol. XXIV, Part II, 1934.
(4) Walker and Hickson, Bur. Stds. Journ. Research, p. 1, vol. 1, July 1928.
(5) Federal Specification ZZ-R-601, Feb. 1930.
(6) Nichols, Prosthetic Dentistry, p. 298–310, The C. V. Mosby Co., St. Louis, Mo.

TAKE ADVANTAGE OF THIS TECHNICAL SECTION

(*Continued from page 37*) windshields and in some cases stunning the pilot or disabling him with flying glass. Just why ducks should be chosen as the chief culprits is not known, unless it be that someone was "ducking" the issue. If the average combined speed of the airplane and duck is 270 miles per hour and the duck weighs about 4 pounds, an energy of approximately 10,000 foot-pounds is involved in the impact. We considered making drop tests in the Washington monument until second thought revealed that it would be necessary to drop a 20-pound weight down the 500-foot shaft to get a 10,000 foot-pound impact. For theoretical reasons it is also necessary to keep the mass and velocity conditions more nearly like those to be encountered.

Another problem brought to our attention is the matter of coffee cups for prison dining rooms. The usual heavy china cup or "mug" in the first place, does not stand up well under the rough dishwashing treatment to which it is subjected and, in the second place, is most unyielding when it collides with a guard's head. The prison authorities are looking yearningly toward the lighter and more resilient plastics.

A subject which has been urgently suggested to us by several members of the industry as meriting our im-

mediate attention is the matter of test methods for plastics. This is a branch of scientific endeavor in which the National Bureau of Standards has made many previous contributions in other fields. There is no doubt that despite the notable work of Committee D-9 of the American Society for Testing Materials in establishing standard procedures for testing insulating materials, there exists considerable non-uniformity and confusion in many of the tests not considered by this group. The data given in the properties chart in the October issue of MODERN PLASTICS illustrate the difficulty of obtaining reliable comparisons based on results obtained in different laboratories. Furthermore, the large number of vacant spaces in this table indicates a real need for more data on the properties of plastics. If the plastics industry were organized into an association similar to those existing in the rubber, textile, paper and leather industries, it would be an easy matter to proceed with a standardization program in the matter of tests. In fact, this has been one of the first problems which these trade associations have tackled upon their formation. It is hoped that we can obtain the active cooperation of the industry in our work and that some real progress can be made toward providing better and more uniform data on the properties of plastics.

BRITISH MOLDER VISITS AMERICA

(*Continued from page 32*) "How do you think plastic applications in this country compare with those in England? I mean by that, in which country is the best use made of these materials?"

"I think England shows a little more ingenuity. You see a great many more items offered there than here. For example: I find you are using ordinary convenience (toilet) seats very extensively in the different hotels. We have a number of molds of these and they are used quite generally in England. We are also molding a lot of small lamp shades, up to about six inches. We have them square, round and oval and all sorts of shapes. Another thing, we mold a greater diversity of larger electrical parts and building hardware than I have seen here. Of course, all our lamps under 150 Watts are of the bayonet type and unlike your own. We also mold a great many meter cases, even of the prepayment type mostly in black, brown and walnut."

"How do molding materials compare with those you use?"

"Well, one thing rather amazes me here. You do not use wood-filled urea which we use extensively in England. I discovered it quite by accident when I first arrived. I bought a tube of my favorite tooth paste and discovered that the green molded top had not kept its color like the one I brought from home. I learned that it is molded of phenolic while ours is molded of wood-filled urea, or WF as we call it. We are molding all sorts of cosmetic cases which are of course opaque instead of translucent but the colors do not fade. We also mold caps (closures) and beakers of WF which is abso-

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lutely safe for contact with foods whereas I wouldn't say that phenolics are entirely suitable."

"How does the cost of WF, as you call it, compare in price with our ureas?"

"About half. In fact it compares favorably with the price of phenolics—about nine pence a pound; that would be eighteen cents here."

"Is wood-filled urea as good as that which is filled with purified cellulose?"

"That is hardly a fair comparison. WF is better for many applications because it is cheaper but it hasn't the translucence that straight ureas possess. Where translucence doesn't matter, and where brilliant color is desired, it is better than either cellulose urea or phenolics because of its price differential and because it holds its color. And after all, what does it matter that a cosmetic jar is not translucent so long as it is white and will remain white? WF has been improved considerably in England during the last few years and is still being improved. You can get a reasonably good white, a cream white, and all the pastel shades. For opalescent lighting fixtures of course it wouldn't do, but you can use it for practically anything else although it is rather more difficult to use in certain complicated molds. It comes out of the mold a little more soft and if you have a difficult ejection it may tear.

"Do you get as large runs in England as we do here?"

"I am not certain of your runs. I don't know what they are to any extent."

"What is an average run in your shop?"

"That depends upon the firm ordering, but I would say that about 20,000 to 25,00 parts is an average run in England. Many concerns there will try out a molding and place orders very carefully. If the item goes, then the run continues and the orders are fairly large."

"Do you use more single cavity molds?"

"No, I don't think so."

"What is the largest number of cavities you use over there?"

"In our place I think we have a sixty-cavity mold but I have seen 145 here on bottle caps. We do not do much in the way of bottle caps in our plant."

"How do you find the quality of our molding compares with that of England."

"I have seen some very fine moldings over here, nice work done with very fine flash and on the other hand I have seen some of the other kind. But we see both in England, too. I think we obtain a much better job of chromium plating on our molds than I have seen here and that is important when finishing operations are taken into consideration."

"Do you use self-contained presses or a centralized accumulator?"

"We use centralized accumulators and have two pumps in case of a breakdown of either one. We can switch from one to the other in case of failure without any shut-down of our plant. You can hardly have duplicate motors on self-contained presses and we find the accumulator system more practical and economical. We operate two shifts a day, five days a week. One shift begins

at eight in the morning continuing until seven at night. The other begins at eight in the evening and runs until seven o'clock the next morning."

"Do you find it an advantage to shut down for an hour between runs?"

"Yes, for it gives one lot of workmen a chance to get out before the others come on and it allows the maintenance men an opportunity to see to the little things that always need to be looked after. It also gives the sweepers a chance to get in around the presses and actually keep the floor clean. Sweepers are constantly going about the shop and every Saturday morning the floor is cleaned with steam."

"Do you pay your men a salary or do they work on piece work?"

"Everything is done on piece work and we have found that it has stepped up production considerably. We have had to tighten up on inspection, however, but we find this arrangement eminently satisfactory."

"Do you consider your trip to this country has been worth while?"

"I most certainly do. I firmly believe that the exchange of ideas between countries is of definite benefit to all concerned. I have made arrangements with a number of American molders to exchange not only ideas, but samples and blueprints of items that are progressing well in England, in return for sample moldings which they have agreed to send to us regularly. In fact, I have gone so far as to appoint an American representative to look after these things for me here. There is one thing I am grateful for in England and that is that we do not have to have as many special powders as are considered necessary in this country. We are great believers in general-purpose powders with standardized properties so far as possible. This eliminates the necessity of large inventories and keeps our powder turning over with greater rapidity with less likelihood of its becoming stale."

Noting that Mr. Higgs wears a stopwatch on his wrist, I asked if he timed the operations in his shop frequently. This question brought out a very interesting device used in the Synplas shop. Each press is equipped with a clock actuated green light which lights when the part in the press has had sufficient cure. If a pressman opens his press before a part is properly cured, it is perfectly obvious to the shop foreman. This is equally obvious if the part is being over-cured because it can be instantly seen that the press is closed yet the green light is on.

As a further check on production, there is a duplicate of this system in the production office, in addition to an electrically operated counter for each press in the shop which shows constantly just how many parts are being produced per hour. Each lift of the press operates the counting device and it can be readily seen if production lags, and the cause can be quickly checked. Kind of tough on the workmen, we thought, but when we learned that everyone stops for a few minutes at eleven each morning and again at four in the afternoon, for tea which is served at the expense of the firm, we decided that Synplas couldn't be such a bad place to work in after all.

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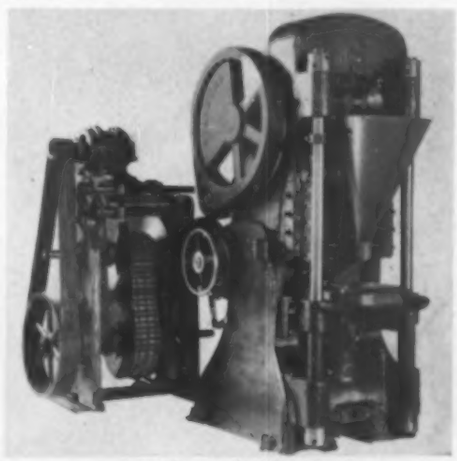

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